

DOCUMENT RESUME

ED 088 157

EA 005 782

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TITLE Research and Development in Education: Analysis and Program Development.
INSTITUTION National Inst. of Education (DHEW), Washington, D.C. Planning Unit.
REPORT NO P-102
BUREAU NO BR-1-7059
PUB DATE Aug 72
GRANT OEG-0-71-3636(515)
NOTE 171p.; A related document is ED 067 517

EDRS PRICE MF-\$0.75 HC-\$7.80
DESCRIPTORS Agencies; Archives; Disadvantaged Youth; Educational Development; *Educational Improvement; *Educational Needs; *Educational Objectives; Educational Quality; Educational Research; Efficiency; Federal Government; *Government Role; *Program Development; Resource Allocations

IDENTIFIERS Equity; *National Institute of Education; NIE; NIE Archives; Research and Development

ABSTRACT

This report examines in detail the major goals of the National Institute of Education (NIE); i.e., improving (1) the quality of education, (2) education for the disadvantaged, and (3) resource use in education. It first examines the domain of education in the United States, considering the objectives of education and the role of the formal educational system in its relation to all the societal sources of education. Brief presentations are made of the evidence in the most serious areas of failure to meet educational goals. NIE subgoals to help improve the quality of education -- providing a rigorous intellectual challenge, expanding opportunities for students to experience effectual action, reintegrating schooling and "real life", fostering educational diversity, and encouraging articulation of the goals and process of education -- are then defined and examined. Examined next are NIE subgoals for acquiring more authentic knowledge of the poor child; adapting educational practices to the realities of home, community and peer interactions; and responding to heightened awareness of educational deficiencies. Problems involved in attempting to improve resource use in education are examined according to internal efficiency, external efficiency, and distributional equity. The document briefly examines some constraints and limitations to R&D in education and suggests several strategies for overcoming them. In conclusion, the suggested program initiatives are summarized in terms of the educational goals they address. A 15-page bibliography is included. (Author/DN)

ED 088157

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Report No. P102

Research and Development in Education: Analysis and Program Development

August 1972

National Institute of Education

Planning Unit

This series is prepared under Project No. 1-7059, Grant No. OEG-0-71-3636(515), for the U. S. Office of Education's National Institute of Education Planning Unit, Suite 1148, 425 13th Street, N. W., Washington, D. C., Dr. Harry Silberman, Director.

This planning document was sponsored by the NIE Planning Unit. Views or conclusions contained in this study should not be interpreted as representing the official policy of the NIE Planning Unit, Office of Education, United States Department of Health, Education and Welfare.

ED 088157

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Report No. P102

**RESEARCH AND DEVELOPMENT IN EDUCATION:
ANALYSIS AND PROGRAM DEVELOPMENT**

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August, 1972

EA 005 782

NATIONAL INSTITUTE OF EDUCATION
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"The stakes are high. The most revolutionary risk ever run by this country was its commitment to universal education. Only one other society in the history of mankind has taken a similar course, and that was Athens, which in the fifth century deliberately attempted to democratize a great aristocratic ethos. Ultimately, that attempt was a failure—the most brilliant failure in human history."

William Ayres Arrowsmith
Commencement Address,
Dartmouth College, 1970

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I. INTRODUCTION AND OVERVIEW

The National Institute of Education is being established in order to help the country carry out its commitment to universal education. Through development of a more adequate knowledge base and its application to problem areas, the Institute is to elucidate and help remove the impediments to education as seen by both the individual and society. In order to begin such a task, the Institute must first try to determine what the most important problems are—today's and those that are likely to emerge over the next five to ten years—and devise promising strategies for their amelioration. This document is one step toward that end.

The planning effort to date has comprised a study by Rand Corporation which identified three priority areas (failures of education for disadvantaged populations, too low quality of education for everyone, and ineffective and inefficient use of resources in education); more detailed examinations by experts in these areas leading to several comprehensive resource papers; panel meetings spanning a variety of disciplines and problem areas and resulting in recommendations to NIE on promising R&D initiatives; and finally, a number of activities directed at possible organization and structure for the new agency to implement its R&D programs.

This particular document is an effort to advance the program analysis to the stage where choices can be rationalized from among a number of possible R&D initiatives; it does not attempt to design an optimal organizational framework for administering the proposed NIE programs. The analysis attempts to scan the domain of education and, through use of existing planning materials and other available resources, concentrate on those areas where current and anticipated needs are most critical and identifiable R&D efforts are most likely to contribute to solutions.

This document begins with an examination of the domain of education in the United States. The goals of education are discussed by distinguishing between *ends* sought by individuals (students, parents, educators) and by society, and *means* or process goals facilitating the attainment of those ends. End goals for students include academic, social, career, and attitudinal skills. The goals for parents include the student skills and, for the parents of young children at least, custodial care. The goals for educators include personal, professional, and economic

satisfaction. Society's goals include the development of human resources to meet demands of production and service, participate in governance, and contribute to the quality of life. In addition, society expects education to provide a selection mechanism for distribution of economic and social goods and possibly a gate-keeper mechanism for the labor market. Means to facilitate these goals are discussed in terms of characteristics the educational process must exhibit, including equality and access, responsiveness, productivity, and coordination with other social institutions. The discussion of goals is tempered by a review of conflicting values and shifting priorities that inhibit general consensus.

The role of the formal educational system is discussed in its relation to all the societal sources of education. Quantitative parameters are presented; the internal functioning is examined; and extra-system influences are noted, including characteristics of the individual, educational institutions, and the home and community, and effects of national and international events. Constraints operating upon and within the system are considered in terms of control, constituent influence, and financing.

Evidence in the most serious areas of failure to meet educational goals is presented briefly. In academic learning, indicators include lack of needed educational reform, achievement scores, and drop-out rates. In social and individual development, they include interest in non-traditional instruction, growth of alternative schools and experimental college programs, anti-social behavior, and the growth of youth subcultures. Evidence of failure to provide the facilitative means of fiscal and educational equality, educational access, productivity, and responsiveness is also cited.

The investigation of the domain of education and evidence of failure lead to the major goals for NIE:

IMPROVING THE QUALITY OF EDUCATION

IMPROVING EDUCATION FOR THE DISADVANTAGED

IMPROVING RESOURCE USE IN EDUCATION

Each of the major goal areas is then examined in detail.

Problems involved in attempting to improve educational quality are examined in the context of the end and process goals of education. From this examination the NIE subgoals for improving the quality of education are derived: providing rigorous intellectual challenge; expanding opportunities for students to experience effectual action; reintegrating schooling and "real life," fostering educational diversity; and encouraging articulation of the goals and process of education. Important assumptions or beliefs underlying past attempts at educational reform are discussed in the context of these subgoals. Gaps in knowledge are identified and some possible next steps are indicated. This analysis provides the rationale for suggested R&D initiatives for improving the quality of education. *Rigorous intellectual challenge* is possible only through the development of approaches that promote genuine engagement with the substance of instruction and that teach complex skills and the use of knowledge as a tool; the provision of appropriate purveyors of those approaches such as educational technology and a range of different types of teachers; and the dissemination of those approaches. *Providing opportunities for effectual action* inside and outside the classroom requires the development of programs that give the student academic, social, and career learning responsibilities, programs that are also necessary for intellectual challenge, and *reintegrating schooling and real life*. This integration must proceed simultaneously in two directions: moving the student into the community and moving the community into the school. *Fostering educational diversity* should involve supporting good examples of non-traditional study and designing alternatives to present instructional and institutional patterns that will meet the needs of poorly served client groups. *Encouraging articulation of the goals and processes of education* requires an assessment of current practice and thorough dissemination of that assessment. Each suggested NIE program initiative which has impact on the subgoals for improving the quality of education comprises programs that speak primarily to a single subgoal but may also be relevant to others: although each initiative may be implemented independently, they enhance one another and so should not be viewed discretely. (See specific initiatives below.)

With the understanding that all the problems discussed for improving the quality of education are of great importance to disadvantaged children and youth, the analysis proceeds with additional problems that must also be addressed in order to improve education for the

disadvantaged, including the "mystique" of the disadvantaged child and the perceptions and stance of social institutions toward poor and minority populations. The problem analysis concludes with the NIE subgoals for improving education for the disadvantaged: acquiring and applying more authentic knowledge of the poor child; understanding and changing school and institutional action; adapting educational practices to the realities of home, community and peer interactions; and responding to heightened awareness of educational deficiencies. Each subgoal is then examined in terms of the current state of knowledge and experimentation in order to explore underlying assumptions and delineate important, but unexplored, questions. This analysis develops the rationale for suggested R&D initiatives for improving education for the disadvantaged. Although all the suggested programs should provide *more authentic knowledge of the poor child*, specific work should be directed toward anthropological and sociological studies of teachers, schools and communities. This work should be included in a compilation and analysis of knowledge concerning the failure of education for the poor. *Understanding and changing school and other institutional actions* may be facilitated by programs which involve the multidisciplinary design of alternative schools and the development of educational elements known to enhance the learning of low-income students. Programs for studying classrooms, schools and communities and for designing alternative schools will also attempt to *adapt educational practices to the realities of home, community, and peer interactions*. Promoting more *responsiveness to society's increasing awareness of educational deficiencies* should involve the development of multidisciplinary problem-oriented courses for adolescents, whose sensitivities to social concerns are, in some instances, especially keen. Each subgoal is addressed by at least two of the suggested programs; nearly every program addresses more than one subgoal. In addition, the programs also address the major end and means goals from academic skills to social and personal development and from equality to responsiveness and coordination. (See specific initiatives below.)

Problems involved in attempting to improve resource use in education are examined in three categories: internal efficiency, external efficiency, and distributional equity. Each problem is discussed in terms of specific sub-problems and the current state of knowledge. This analysis leads to the conclusions that:

the relationships between resource use and educational benefits are not well understood; the contributions of education to private and social gains, particularly causalities, are unclear; current patterns of distribution of resources and benefits are being questioned; definitions of educational output are narrow; significant variances in resource allocation are nearly non-existent; and choices for the consumer or opportunities for decision-making are limited. Out of this discussion grow the suggested R&D initiatives for improving resource use in education. Improving internal efficiency, external efficiency and distributional equity all depend upon the development and availability of information that will be useful in decision-making. *Determining the contributions of education to private and social gains* requires measuring educational outputs over a much broader range. *Relationships between resource use and educational benefits* need to be studied through development of existing educational technology, demonstrating uses for it to improve productivity, and exploration of alternative mixes of educational technologies at different levels of education. *More choices for the consumer and more opportunities for decision-making* will provide better matches between educational offerings and the needs of students, their learning style, and societal requirements. A systematic *analysis of rewards and incentives* will provide information for increasing internal and external efficiency. Policy-oriented research on alternative strategies for school finance provides positive directions concerning the *distributional equality of current patterns of distribution of resources and benefits*. The overall objective of all the program initiatives is to enhance the process by which education is conducted along the dimensions of equality and access, responsiveness, productivity, and coordination (See specific initiatives below).

The document then briefly examines some constraints and limitations to R&D in education and suggests several strategies for overcoming them. One recommendation suggests the use of several modes of R&D—building a knowledge base, spreading good practices, taking advantage of natural experiments, sponsoring new experiments—all of which have different time dimensions but should be carried on simultaneously in order to feed into one another. A model for project development in sensitive societal areas is then presented.

In conclusion, the suggested program initiatives are summarized in terms of the educational goals they

address, the modes of research and development they represent, and the fiscal balance they provide. Criteria are given for making priority choices among suggested programs including: appropriateness as an activity for the Federal government; appropriateness as an activity for NIE; potential significance; feasibility of the program; pay-off; adoptability; potentially undesirable side-effects; and program balance. Next steps are outlined, including the integration of OE activities to be transferred, and the development of a detailed budget.

A. R&D Initiatives for Improving the Quality of Education

1. Complex Skills

This program would examine and develop approaches to the teaching and acquisition of complex skills such as heuristic problem solving, information processing and evaluation, information composition and display, and learning how to learn. The program would involve defining promising problems and issues for advancing higher cognitive learning; designing new instructional components; and developing appropriate formats for instruction, such as discrete courses, modules for traditional courses, computerized instruction, and problem-oriented units; and implementing appropriate approaches in a variety of elementary and secondary schools.

2. Purveyors of Instruction

An effort demonstrating the feasibility of alternative purveyors of instruction to enhance the quality of education would include, specifically, multi-leveled staffs and educational technology. For multi-leveled staffs, the program includes defining, through careful observation, the variety of roles teachers perform in the classroom; determining the various kinds of non-teachers who could perform some of these roles, such as older students, clerks, recreation leaders, and nurses; designing the total staff composition from the proportion of time the teacher spends performing each identified role; and determining the feasibility of implementation, in terms of reasonable cost, the availability of the kinds of people necessary, and the receptiveness within the community about to staff a new school.

For educational technology, the program includes examining the history of R&D in educational technology

for educational effectiveness, both cognitive and affective; costs, both start-up and continuing; suitability for specific settings; and anticipated contribution to quality. On the basis of this examination, the program will identify and develop the most promising experiments, with careful matching of optimal technology to level and purpose of educational setting; and pilot and evaluate in several sites the most promising developments.

3. Early Exit Experiment

This program would reduce the separation between high school and the real world by lowering the compulsory school attendance age to 14, and giving students entitlements at the end of ninth grade, usable at any time in either school or non-school settings. The program would involve designing the basic structure of the experiment, including eligibility criteria, fiscal support mechanisms, and certification; developing and field-testing entitlement options for the non-school settings, such as modified trade and industrial apprenticeships, business internships, and public agency courses and programs; and implementing the above in a small number of school systems to test out the total design.

4. Unbundling of Higher Education

This program would create alternatives that will introduce greater flexibility and responsiveness to individual students into systems of higher education by separating into discrete components—carried out by both the profit and non-profit sectors—a variety of the services offered and the functions served by institutions of higher education, such as instruction, credentialing, and counseling. Development activities will include the extension of existing components, such as ETS College Level Examination Program, New York State Regents External Degree Program, and extension of the University-of-the-Air and the TV College prototype to cable television. Further development will include the creation of new components, such as professional association credentialing mechanisms, business and industry professional courses, and counseling and placement agencies. Implementation will occur over a number of years beginning with the extension of credentialing mechanisms and development of discrete instructional components.

5. Understanding and Supporting Emerging Innovations—Open Education

This program would support emerging innovations to understand what makes them work, how they can be replicated, and what their consequences might be. Current candidates for support include alternative schools, accountability (including performance-based criteria for assessment and performance contracting), and open classrooms. Using open classrooms as the vehicle for developing the investigation model for any emerging innovation, the method includes establishing criteria for success in open classrooms; closely monitoring successful examples; articulating, whenever possible, the theory behind open classrooms; determining support strategies necessary for successful replication, such as teacher training, administrative support, and student characteristics; and synthesizing information to feed into further implementation of open classrooms through a second round of proposals for replication of high-quality programs.

6. Expanding the Usable Knowledge Base

This program would carefully examine a variety of current educational practices to aid in the articulation of the goals and processes of education. The examination would include basic studies in naturalistic settings, investigation and dissemination of successful practices, and goals assessment. A variety of dissemination techniques would be employed to insure that information reached all appropriate audiences: policy makers, educators, students, parents, and the general public.

B. R&D Initiatives for Improving Education for the Disadvantaged

1. Multidisciplinary Design of Alternative Educational Programs

This program includes the design and trial of comprehensive educational programs by multidisciplinary groups reflecting unique educational needs and values of particular students and communities. Examples of participants include sociologists and anthropologists, psychologists, members of the community to be served, school people, and people in the alternative school movement. Educational design and feedback will involve various perspectives and methodologies and will require adequate time and resources for development. Development will probably involve a university or educational laboratory working with a school system to provide long-term stability.

2. Developing Educational Elements

This program would pursue in a systematic fashion, development of the most promising elements that have worked in the education of the disadvantaged, so that they can be adopted in existing educational settings. Examples include activities that motivate through interesting subject matter or that are fun in themselves, tutoring of younger students by older ones as a means of improving learning of both, the use of persons in different kinds of organizations as instructional resources, and the use of neighborhood paraprofessionals. The program includes identification of existing elements; determination of strategies necessary for successful dissemination and implementation, such as teacher training, publicity, production and distribution, and demonstration sites; and analysis of elements appearing in promising approaches to be used in a second round of developing new and existing elements.

3. Multidisciplinary Problem-Oriented Courses for Adolescents

This program would provide accurate information about societal structures and institutions so that the idealism of youth can be harnessed to sound perceptions. The knowledge base includes history, sociology, political science, anthropology, economics, and ethnology. Development work involves the cooperation of persons representing disciplines listed above to produce, not a pre-packaged set of materials, but a compendium of information that could be adapted to unique situations, perhaps containing instructional modules for teaching authentic understandings of social institutions.

4. Anthropological/Sociological Studies of Teachers, Schools and Communities

This program would increase the ability to remedy educational failure by the application of knowledge gained from systematic observation and the study of good practice and of the milieu of specific communities in which poor children are receiving less than adequate education. Examples include in preschool and elementary school: Head Start and Follow Through as natural laboratories, and cooperative arrangements with current program evaluations; in secondary school: identification of suitable traditional and experimental settings and emphasis on the schooling/work interface as

related to the community milieu; in post-secondary school: needs and expectations of new client groups, milieu of southern black colleges, adaptive behavior of minority and majority students at elite institutions, and effects of open-admission policies. The study is part of an overall NIE effort to broaden the base of education by drawing on the knowledge available through other disciplines. It should provide helpful information in integrating school practices with community values and expanding a community's understanding of its educational needs. Ultimately the results of such studies could assist educators in matching practices and procedures with the values, beliefs, and life styles of specific populations.

5. Compilation and Analysis of Knowledge Concerning Failure of Educational System with the Poor

This program would increase Federal and local ability to remedy the failure of the educational system to serve the poor by systematization and analysis of present and future knowledge. It would replace the present unfocused style of assessing and attacking educational problems with an approach toward a science and technology of education in which understanding accumulates. Examples of items to be included in this constantly growing and changing compendium include current knowledge, the state of the educational system as it relates to poor families, results from anthropological studies (Program 4), and current research plans of Federal and other agencies.

This compendium would be made generally available, perhaps in several forms such as loose leaf and microfiche, with periodic amendments and printed monographs.

C. R&D Initiatives for Improving Resource Use in Education

1. Multiperspective Analysis of Educational Objectives and Evaluation

This program is necessary to understand the functioning and benefits conferred by the system and to develop measures of educational outputs over a much broader range. Some examples are the development of criterion-referenced achievement tests that measure complex skills and theoretically sound techniques for

the measurement of affective variables; the use of improved measurement devices to build models of educational output across the cognitive and affective domains, taking into account the multi-dimensional, dynamic nature of educational objectives and the educational production function and non-school influences on them; the development of guidelines concerning the amount of testing and the mix of techniques; and the sponsoring of cross-national studies of educational goals, their relationship to social and industrial development, and their assessment. Through interaction with representatives of various groups, the program would develop improved assessment techniques and models of the education production function.

2. Experimentation in Education Production

This program would explore alternative mixes of educational technologies used for instruction at different levels of education, including both management and communications technologies. Each mix to be tested should be designed so that per-student costs (exclusive of development costs) are equal to or less than present national averages, with a specific focus on efficiency. Some examples are teaching of basic skills in elementary school via computer-assisted instruction, technology-based community colleges, experiments with aggregation and disaggregation of institutional sub-units and/or functions for higher education, and experiments with a variety of different staffing patterns and much more extensive use of students for their own instruction. Economists using information derived from production studies would be instrumental in planning, development and evaluation in this program area with the assistance of persons from a variety of disciplines.

3. Choice and Decision-Making

This program would provide a better fit between students' needs, their learning styles, and societal requirements in order to respond to widely perceived dissatisfaction with educational outputs and distributional equity. Alternatives from which to choose and mechanisms to exercise those choices are necessary in this program area. Some examples of alternatives include assistance in the design and testing of several alternative voucher plans, some of which would focus on internal efficiency, others on the content of schooling; and use of naturally arising alternative schools inside and outside the system and experiments in higher education to develop systematic analysis of effects. Examples of mechanisms for exercising choices include studies of

existing decision-making structures in school systems, parochial and private schools, and institutions of higher education, including effects of current decentralization efforts; and development of multilayered information systems that will give feedback to parents, teachers, and policy makers on available alternatives and anticipated consequences of specific choices. In its initial stages, program activities should focus on naturally occurring experimentation and cooperation with other agencies, such as OEO.

4. Incentive and Reward Structure

This program would include a two-level effort integrating experimentation and study of incentive and reward structures for teachers, administrators, and students, along with the implementation of alternative methods. Some examples are studies of current rewards and incentives in a wide variety of institutions, experiments with alternative reward schemes, experiments with different credentialing and promotion criteria on which current reward systems are based, and continued experimentation of the sort OE has recently begun, under contract, in which parents, students, and teachers are paid cash bonuses for student progress. Assessment specialists, economists, management experts, psychologists and sociologists will be involved to build basic knowledge and theory by studying on-going experimentation and mounting some carefully designed and tested new experiments.

5. Studies in Efficiency and Productivity

These studies would involve basic research in a number of poorly understood areas of efficiency and productivity in education, focusing upon building a conceptual framework for understanding causal relationships in educational efficiency and effectiveness. Some examples of the educational production process include the investigation of historical changes, productivity, and efficiency of schools operating for profit (e.g., technical or secretarial schools), and inner city schools operating with normal budgets that show substantial success in educating disadvantaged children; the study of ways in which schools respond to high levels of financial pressures and concomitant effects on learning. Examples of programs in external efficiency include follow-up studies of graduates from several institutions of higher education representative of two- and four-year private and public colleges and universities, and studies of relationships between education and worker productivity and other indices to

illuminate those characteristics of each area studied that are influenced by schooling.

Examples of programs aimed at distributional equity include policy-oriented research on alternative strategies for school finance consistent with present court decisions, and research on the extent to which the educational system can affect the distribution of income and, in particular, on the role it might play in the eradication of poverty.

Several of the R&D initiatives described above, while focused to respond to specific subgoals in the three priority areas, actually comprise similar activities and hence, for purposes of efficient program management, would be combined in actual operation. For example, Expanding the Usable Knowledge Base (Quality-6), Anthropological Studies (Disadvantaged-4), Knowledge Compendium (Disadvantaged-5), and Studies in Efficiency and Production (Resources-5), all address the issue of improving the informational and conceptual base of education. Thus their specific concerns of goals assessment (Q-6), observation of school and community practice (D-4), delineation of economic factors in education (R-5), and compilation of relevant information in usable form (D-5), can be combined in a single large-scale program incorporating multiple approaches toward improving the knowledge base in education.

Similarly, Purveyors of Instruction (Quality-2) and Education Production (Resources-2) have in common a focus on educational technology and on experimentation with staffing. They can therefore be combined into a single program with a dual mission: using communications and management technologies to improve both the quality of the educational experience and the productivity of the educational process. Though specific projects would vary in terms of emphasis, comprehensiveness and specific purpose, the types of activities to be supported for developing learning experiences to teach Complex Skills (Quality-1), to further Educational Elements (Disadvantaged-2) that

work with poor children, and to teach adolescents about social institutions through Problem-Oriented Courses (Disadvantaged-3) are sufficiently similar that these three initiatives could also be combined into one comprehensive program area.

Continued elaboration of the suggested initiatives will reveal additional connections. In general, each initiative is intended to address one goal primarily, but will also have impact on several others; most initiatives also permit the use of several R&D strategies. Suggested programs cluster heavily in the areas of the knowledge base and new experiments. This is deliberate, since much of the OE program to be taken over falls into the areas of spreading good practice and taking advantage of natural experiments, so that, for the first year or so, these modes will in fact be more richly funded than the other two.

The goal of Career Skills is not heavily addressed by the initiatives since another major component (Career Education) to be transferred from OE is exclusively devoted to it. The goal of Academic Skills is more heavily addressed than either Social or Self-Development Skills. There are at least three reasons for this: (1) cognitive learning, particularly of the more complex skills, is still considered the main function of formal schooling; (2) the knowledge base, including ways to evaluate achievement, is weak for both social and self-development goals; and (3) not much is going on in terms of good practices or natural experiments to meet these goals. For the last two reasons, the initiatives in these areas concentrate on the knowledge base and on new experiments.

The emphasis for all goals on the knowledge base reflects the strong conviction that one of NIE's primary functions is to become a center of expertise concerning major problem areas of education. The intramural component of the agency is expected to make a major contribution to building the sound base necessary if experimentation in education is to lead to lasting reform.

II. THE DOMAIN OF EDUCATION IN THE UNITED STATES

A. The Goals of Education

The formal educational structure of the United States involves nearly a third of the country's population

and is supported by an investment of almost \$70 billion, over 7% of the Gross National Product. This makes the educational enterprise, after defense, the highest spending public service; only health expenditures at \$66

billion approach education. An additional 60 million persons are involved with peripheral but often highly organized education representing a considerable additional investment: for instance, the estimated cost for Department of Defense education activities alone is \$8.5 ± 2 billion. (See Table A-1 and Figure A-1. All tables and figures prefixed A are located in Appendix A.)

Why do the country and the individual invest such large human and monetary resources in education? What benefits do they expect to gain? The goals of education can be—and have been—categorized in various ways, but the categories generally exhibit common elements. It is useful, for the purposes of this study, to distinguish between 1) *Ends* sought by individuals (students, parents, educators) and by society, and 2) *Means* facilitating the attainment of individual and social ends. At the early levels, the expectations of parents and society dominate; at secondary and higher levels, the student's goals begin to emerge, sometimes in opposition to those of educators and society. As one examines the aspirations of individuals or sub-groups and the expectations of society, the areas of agreement and conflict become more clearly understood.

1. End Goals

a. Individual Expectations. Students and their parents expect the educational system (lower and higher) to provide the academic, social, career, and attitudinal skills needed to attain access to the society and lead individually satisfying lives.

Academic learning is intended to provide for the transfer of knowledge and the capacity to evaluate, digest, and use it. It ranges from the acquisition of basic skills, facts, and concepts to the ability to analyze and solve problems, to reorganize and synthesize information, and to develop new knowledge.

Social skills are expected to equip the individual with the capacity to attain the status to which he aspires through understanding and being able to deal with the social institutions impinging on him, and to develop his ability to get along with others in a variety of relationships, to respect their rights, and to expand his tolerance for variance.

Educational goals concerning success in careers include the learning of specific vocational and professional skills which may be either cognitive or

social, or—more likely—a combination thereof, and the accompanying development of motivation and drive towards accomplishment.

More and more, the individual looks toward the educational system to help him develop the capacity to lead a full and just life—at least the denunciations of the system for its failures in this domain provide evidence that teaching aesthetic appreciation, ethical behavior (e.g., a sense of community), a feeling of self-worth and competence, enjoyment of one's natural and social environment, and other attitudes is now expected to be part of formal schooling.

In addition to these goals, parents also expect the whole structure—but particularly at the early levels—to function as a custodial institution. This is clearly exhibited in aroused public opinion when school closures threaten. Such threats are, in fact, used by educational personnel (teachers for bargaining purposes, superintendents to obtain additional funds) in crisis management. As one anthropologist recently remarked, "Homes shut down during school hours."

Expectations of the staff manning and administering schools and institutions of higher education are to achieve for themselves rewarding careers that yield personal, professional, and economic satisfactions. Since the numbers thus engaged represent more than 1% of the population, they exert considerable leverage not only on the educational system itself but on society at large in regard to what the system should be like and how it should function. Some earlier targets for education (see Table A-2) have often had more to do with enhancing the career goals of educational professionals than with improving the services provided to education's clients.

b. Society's Expectations. It is in the common interest that individuals develop as fully as possible their cognitive, social, and career skills touched upon above, and that the young be cared for. Conflict may develop, however, between individual goals and societal ones, for instance, in individual pursuits of careers and the needs of the labor market. Thus, we can recognize societal goals as distinct from individual ones. Societal goals for the system of education include adequate development of the nation's human resources, requisite skilled workers and professionals to meet demands of production and service, citizens able to participate in governance of the nation, and individuals able to contribute to the quality of life for all.

In addition, since this society is stratified (as are all others) but unlike others has no rigid demarcation criteria, it uses the educational system as a selection mechanism by which to distribute economic and social goods. This particular societal goal has had some unfortunate consequences, such as narrowing the definitions of achievement and continually prolonging formal schooling.

It is also often argued that the prolongation of schooling serves to keep unneeded workers off the labor market for several years, and that this is indeed one of the societal purposes intended for the educational system, but some economists (e.g., Zvi Griliches) dispute the need to use the system in this fashion, claiming sufficient elasticity for the labor market to regulate itself, particularly in the coming years of decreasing entry rates.

2. Means to Facilitate Educational Goals

If the process by which education is provided is to further rather than inhibit the attainment of goals sought by individuals and society, it must exhibit the following characteristics.

a. Equality and Access. Educational goods must be available on an equitable basis to all able and motivated to profit from them. The meaning of equality and/or equity is now undergoing intensive review by the courts, legislative bodies of several states, and the Federal Government. As to access, a number of groups now do not have adequate access to preschool or to higher or continuing education, the former because of scarcity of facilities, the latter because of the rigidities of institutions.

b. Responsiveness. In order to allow the matching of educational services to the expectations of those served, the latter must have the ability to influence what happens in educational institutions. Only through involvement of their clients in decision-making can institutions be responsive to changing needs and aspirations; only in this way can they maintain legitimacy, not only for themselves but—because of their ubiquity—for social institutions in general.

c. Productivity. The whole system and its component parts must so allocate available resources that desired services can be provided at a cost that individuals and society are willing to pay.

d. Coordination. The investment in and processes of education should enhance the quality of other social institutions, rather than impoverish them: that is, education needs to work in concert with and be supportive of home, community, health care, etc. Nor should unwarranted costs for education diminish the availability of other public services.

3. Conflicting Values and Shifting Goals

While it is possible to distill a set of goals from current practices, expectations, and criticisms concerning education, closer examination reveals that there is in fact no unanimity on either purpose or process across different groups of people at any given time; nor do expectations stay stable over time.

a. Diverse Goals. Education is a social institution; as such, it is deeply embedded in the culture and reflects the value systems inherent in society, often leading to conflicting and even irreconcilable goals (see B. Clark, 1971).

1) Individual Development Versus a Common Cultural Core. One of the hallowed aims of American education (as contrasted to that of totalitarian countries) is the development of each individual to his fullest potential. Much criticism of the formal system is concerned with the failure to provide the kind of choice, diversity and individualized instruction necessary to achieve this aim. But more recently, such critics as Bronfenbrenner (1970), Bettelheim (1969) and Riesman (1956) have pointed out that American education with its stress on individual achievement does not build the sense of community, the commonality of values needed to assure continued functioning of society.

2) Cultural Plurality Versus Entry into the Mainstream. There is growing resistance to using education as a focus for the assimilation and amalgamation of divergent subcultures. The notion of the "melting pot" is discredited. And yet, educational channels are still expected to provide to members of any and all groups the tools (academic, social, and career) needed to "make it" in the majority culture if they should so choose.

3) Quality Versus Egalitarianism. The formal educational system of this country has its

roots in European models intended to educate a professional elite (ministers, doctors, lawyers). These antecedents are most clearly exhibited in institutions of higher education, generally incorporating the German university (scholarship) and the English college (education for gentlemen). The American land grant colleges are an indigenous invention springing out of the needs imposed by new conditions. The drive toward excellence has been encouraged by individual competition. On the other hand, legitimate demand for equal access to educational goods are often translated into expectations of equal educational outputs, a goal incompatible with cultivating talent and excellence.

4) **Centralization Versus Decentralization.** In order to provide increased benefits, and also to take advantage of economies of scale, systems and institutions of education at all levels have consolidated and grown in size (see Figure A-2). Still larger entities, such as educational parks, are being advocated by Pettigrew (1971) and others to deal with problems of inequality of opportunity. But the advent of large urban school systems and multiversities has been accompanied by an increasingly centralized and bureaucratized administration, often characterized by remoteness from the clientele. The dysfunctionism of the unlimited growth of universities has recently been well analyzed by Gallant and Prothero (1972). Hence, there is considerable advocacy of and some experimenting with decentralization and the creation of small subunits (cluster colleges, neighborhood school boards).

5) **Authority Patterns.** There is no longer any consensus as to who should decide on either the substance of the processes of education—the professionals, the parents the students, or society-at-large (as exemplified by such non-educational authorities as the courts, the state government, the Federal government). One study on consensus of educational goals reports: "If the continued existence of schools were dependent upon consensus on educational goals among teachers and their constituencies of mothers and students, the schools would not survive" (Wilder, 1968). Nor is there any agreement on what forms of authority are supportive of learning: traditional hierarchical with the teacher as ruler, or

participatory with the teacher as counselor. Related questions concern the nature of incentives—competition or cooperation—most effective to encourage motivation, achievement, and the development of autonomous but well-integrated persons.

b. **Shifting Goals.** Schrock, Singell, Yordon, *et al.* (1971) point out that earlier goals for education, such as the expectations or targets set for 1970, have in fact been met or frequently exceeded in overwhelming amounts (See Table A-2). Further, "the very success in the achievement of these goals surrounds the discussion of the crisis. For example, increased public expenditure, higher teacher salaries, a reduction in the number of school districts, more and better teachers, and more college graduates can be juxtaposed to resistance to higher costs of education, large monopolistic school bureaucracies, a surplus of teachers, and an excess of college graduates (in relation to jobs available requiring their skills)" (p. 16).

1) **Raised Expectations.** Better-educated parents are likely to hold higher aspirations for their children. Thus, as the proportion of high school graduates and college degree holders has increased, their demands of the educational system have become more sophisticated.

2) **Rising Standards.** When the norm becomes the unusual, it often becomes a problem; e.g., there was no drop-out problem a generation ago when 50% or less of 17-year-olds were high school graduates. Conversely, when the unusual becomes the norm, new educational standards are established by which to evaluate achievement and potential for future performance (See Green, 1971).

3) **Changing Society.** Such futurists as Toffler (1970), Drucker (1969), and Michael (1968) have projected a number of trends that are likely to affect the educational system. Markley, *et al.* (1972) have recently summarized these to include increasing concern with environment and population; accelerating change in society; transition from an industrial, production-oriented society to a post-industrial, service-oriented society; disjunction between supply and demand of trained manpower (as, for instance, in education itself);

increasing leisure for many individuals; increasing dissidence from constituent groups outside the mainstream; and increasing concern with international relationships and national isolationism/security. Such changes will lead to the continued shifting of goals and expectations for education and the demand for appropriate responses.

B. Sources of Education

Traditionally, several of the educational goals, particularly those having to do with development of attitudes toward self and society, have been addressed by institutions other than the formal educational system. Burnett (1971) notes that in the area of socialization, for instance, the impact of schooling comes last:

experience > social experience > socialization > education > schooling

Such extra-school sources of education as parents, other adults, peers, jobs, "leisure" activities (sports, hobbies, social organizations), and the mass media not only play important roles in the transfer of knowledge and attitudes; they also influence, often heavily, what learning takes place within the organized system. Nevertheless, more and more tasks formerly considered the province of family, church, or community have devolved onto schools and colleges. Not only are these institutions now expected to meet responsibilities for social and self-development far beyond their original function of providing knowledge and professional skills; they are also seen as the prime channel for correcting social inequities and creating a society closer to its professed ideals than the present one. Yet the formal educational system is deeply embedded in the social fabric and is therefore a reflection of it, subject to impact from other institutions even as it has impact on them. As organized structures have become more and more central to meeting not only educational goals but also broader social purposes, the formal system has grown into a large, very complex enterprise. An overview of its salient characteristics is a necessary part of any attempt to delineate its current status and develop initiatives for improvement.

C. Quantitative Parameters

Highlights on enrollment, staffing, organization and funding are given here for both lower and higher

education. Appendix A provides a more detailed summary. (Sources used include the annual and biennial surveys and estimates prepared by the Office of Education, National Education Association, and the Bureau of the Census.)

1. The increase in school enrollments is projected to taper off during the next decade. (See Table A-3.) Total fall enrollment (elementary, secondary, and higher education in public and private institutions) increased from 44 million in 1959 to 59 million in 1969 and is expected to be 63 million in 1979, with most of the increase at higher education levels. Distribution between levels has been changing as the percent of total enrollment in elementary schools decreases.

2. More than half of the 18-21 year-olds enter post-secondary institutions, compared to less than 25% twenty years ago. However, fewer than half will complete two years of study; only about one-third will complete four years. The overall increase in the award of Ph.D. degrees is remarkable. More than twice as many doctorates were awarded in 1967 as in 1957 (18,800 vs. 8,938), and approximately one-half as many were awarded in 1960 as are expected to be awarded in 1980.

3. School attendance is lower for children in poverty areas than for children from richer families. Twice as many 5-6 year-old and 14-15 year-old poor children were not in school as non-poor; in the same age brackets, over two-thirds of poor 18-19 year-olds were out of school compared with 45% of non-poor. The median years of school completed for whites age 25 or over was 12.2 in 1970; the median for blacks age 25 or over was 10.1 school years. There has been no significant change in this disparity in the last ten years.

4. Demand for teachers and faculty will be lower during the next decade. There were over 2 million teachers in public schools in 1970, a 50% increase from a decade earlier; the number is projected to hold nearly steady over the next decade with actual decreases in elementary school teachers offset by increases at secondary levels. Instructional staff in higher education increased over 100% (from 200,000 to 411,000) in the last decade, yet is projected to increase less than 40% in the next decade.

5. Total expenditures for education are increasing, from \$32.8 billion (in current dollars) in 1959-60 to \$70.3 billion in 1969-70, and to a projected

\$100 billion in another decade. The average salary of classroom teachers expressed in 1969 dollars increased 41.7% between 1957 and 1969; the cost of a classroom increased about 5%.

6. Average per pupil expenditure in 1970-71 varied from \$1,370 (New York) to \$489 (Alabama). Average expenditures per student for all higher education institutions in 1968-69 was \$2,454. Expenditures by type of institution varied widely with the highest being private universities (\$5,124); next highest, public universities (\$3,450); and lower, public, two-year institutions (\$839). Of the \$46 billion spent for public elementary and secondary schools in 1970-71, about 52% was paid by local governments, about 41% by state governments, and about 7% by the federal government. Source of funds for expenditures of educational institutions is given in Figure 5.

D. Determinants and Constraints

1. Internal Functioning

Probably no single model can show all the important features of the educational system in the U. S. From one point of view, say, the numbers of students served, it may be best described as a pyramid with the 37 million elementary school students providing the foundation and the graduate and professional schools resting on the top. If the focus is on the amount of money spent per student, the pyramid needs to be turned upside down. A flow model of people in and out of the system (See Figure 1) emphasizes its interlocked and interacting nature, showing major components and "feedback" channels between them through which personnel and attitudes move to affect its operation.

a. Teachers. Almost all teachers at the public school level have completed four years of post-secondary education, but the nature of that education varies considerably from that of other college graduates. For the elementary school teacher, the dominant pattern is a major in elementary education given through a department or college of education. Thus, exposure to the substance of various disciplines is often minimal. The pattern separating education from subject matter is not quite so noticeable in the preparation for secondary education, where the prospective teacher usually majors in a subject matter area. But often the wall which separates the central concerns of discipline-oriented departments from concerns over education makes the majors planning to

teach into second-class citizens. Thus, the feedback from post-secondary to elementary and secondary education does not have the cross-fertilizing effects one could hope for.

An important missing loop is the lack of personnel connection with society; no doctors, lawyers, businessmen, engineers, politicians, etc., play a significant educational role in elementary and secondary education—or in higher education.

b. Students. Significant feedback occurs through the channel of students. With rising enrollments in post-secondary education, this part of the system increasingly affects the environment in which all education is practiced. The effect extends to the expectations which society has, to the importance it attaches to education, societal success, and failure. The human products of the system exert control over it in several important ways: through their service on boards of education, trustees, regents, PTA's; and through the attitudes they establish in their children who then become the raw material for the next round of educational processing.

c. Pressure Points. The model shows points of leverage or amplification, in particular the "state certification" valve on the flow of personnel to the lower schools which allows the educational establishment to exert a controlling influence. But the model also indicates the increasing importance of the four-year colleges and universities as a pressure point as they provide not only the personnel who run the lower schools but, more and more, have the opportunity to shape the attitudes which society as a whole has toward the entire system.

2. Determinants

Anthropologists and sociologists point out that the objectives of educational institutions may be furthered or confounded by events quite outside the formal system (See Clark, 1971; Whiting, 1971). The complexity of these interactions is being illuminated by the work of Coleman (1966, 1972), Edmund Gordon (1972), Sexton (1967), and others. A diagram adapted from Dyer (1972) (Figure 2) summarizes the cogent variables affecting educational outcomes. More detailed analyses of the extra-school factors important in reaching stated educational goals follow in later sections; here it suffices to take cognizance of them and of the fact that extra-system influences are as powerful as, and sometimes more so than, school and institutional qualities.

TABLE 1: MAJOR TRENDS IN EDUCATION

- (1) The school-age population is increasing less rapidly (or actually declining).

Age Group	Percent Change	
	1959-1969	1969-1979
Elementary	16.3	- 9.0
Secondary	39.7	5.0
Undergraduate	53.4	19.3

- (2) The high school graduate rate is increasing.

	Graduates as Percent of 18-year-olds
1959-1960	66.8
1969-1970	78.4
1979-1980	89.5

- (3) The demand for classroom teachers in elementary and secondary schools and other instructional staff is declining.

	Percent Increase		
	Elementary Teachers	Secondary Teachers	Other Instructional Staff
1958-1968	32%	74%	112%
1968-1978	1%	18%	39%

- (4) The cost of educating public elementary, secondary, and college students is increasing.

	Expenditure per Full-Time Student (1969-70 Dollars)	
	Elementary & Secondary	College
1959-1960	\$482	\$1,456
1969-1970	783	1,896
1979-1980	986	2,256

- (5) Degree-credit enrollment in 2-year institutions is growing faster than in 4-year institutions.

	Degree-Credit Students in 2-Year Institutions as Percent of all Degree-Credit Students
1959	12.1
1969	19.1
1979	27.1

TABLE I (Continued)

- (6) Proportionately more people are earning college degrees.

Bachelor's Degrees as Percent of Graduation
Age Population

1959-1960	17.5
1969-1970	22.8
1979-1980	27.1

- (7) The proportion of bachelor's and first-professional degrees awarded to women is increasing but has not reached the level of 1920 (47%).

Women as Percent of Bachelor's and
First-Professional Degree Recipients

1959-1960	35.0
1969-1970	41.8
1979-1980	46.3

- (8) A larger proportion of degrees earned are advanced degrees.

	Master's as Percent of Total	Doctor's (Except First Professional) as Percent of Total
1959-1960	16.3	2.1
1969-1970	21.2	2.8
1979-1980	26.6	3.8

Source: U.S. Department of HEW, Office of Education Publications, *Projections of Educational Statistics to 1979-80, 1970 Edition*, and U.S. Department of Commerce, Bureau of the Census Publications, 1971.

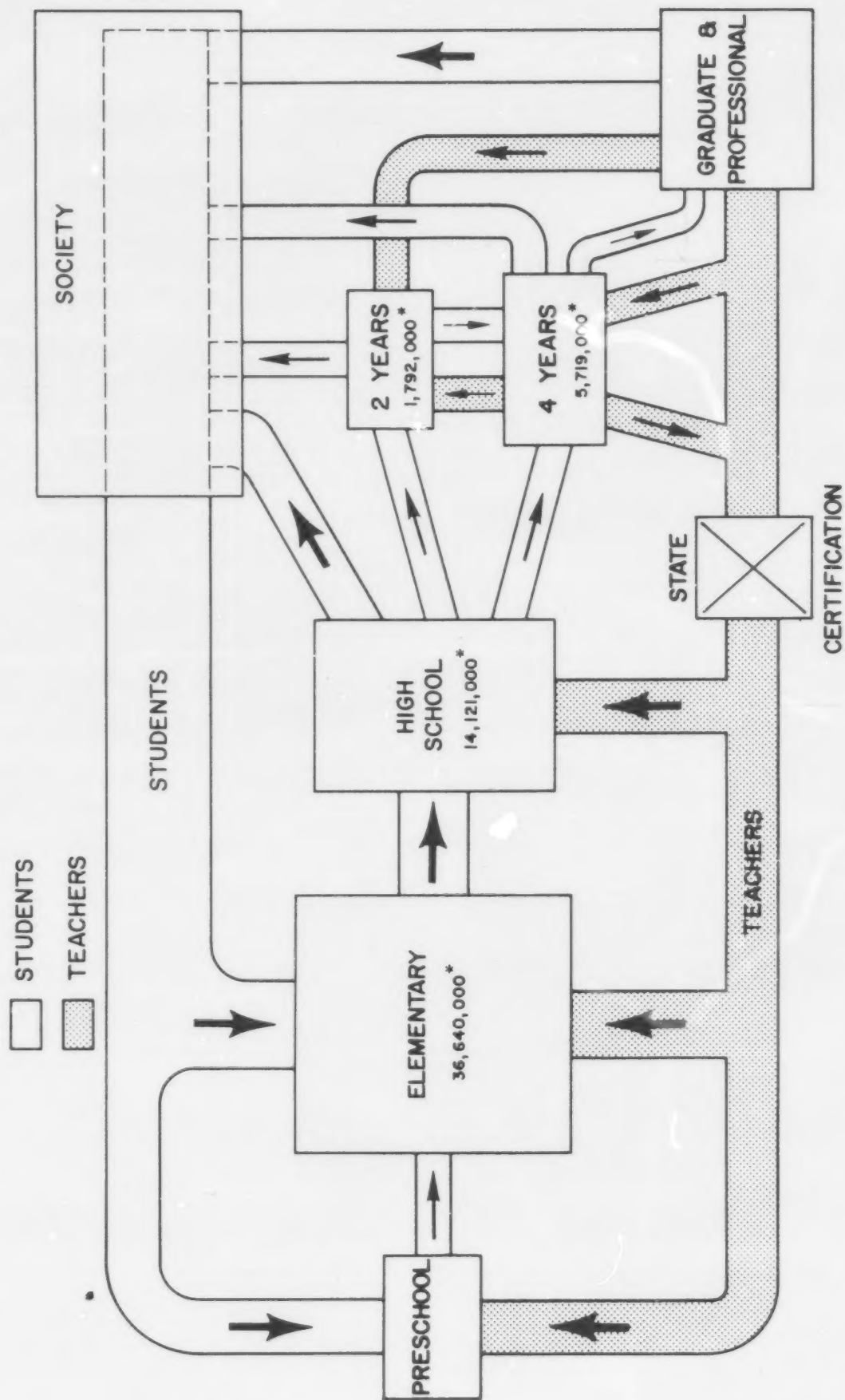


Fig. 1. FLOW MODEL OF INDIVIDUALS THROUGH EDUCATIONAL SYSTEM

Source: 1968 Figures from *Projection of Educational Statistics to 1978-79*, 1969 Edition. Office of Education

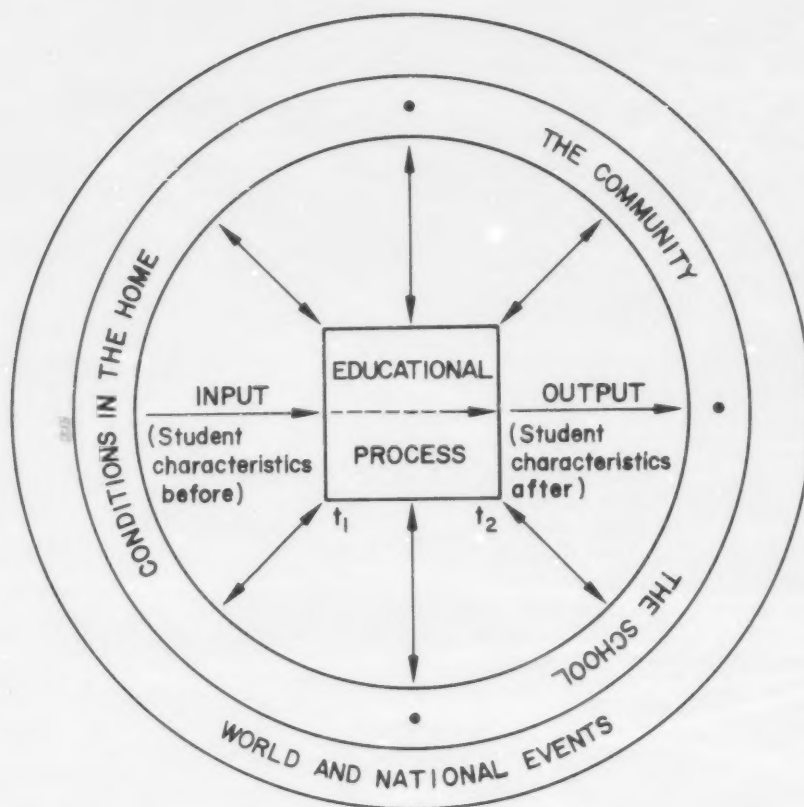


Fig. 2. FACTORS IN THE STUDENT-CHANGE MODEL OF AN EDUCATIONAL SYSTEM

Source: Dyer, from Mosteller and Moynihan, 1972

a. Characteristics of the Individual. What a student brings to school affects his learning. Significant variables are products of his physical and mental inheritance (sex, race, innate ability) as modified by such environmental conditioning as nutrition, early childhood experiences, socialization, and the attitudes and expectations of those around him. The dependence of success or failure on student characteristics holds true not only for the young child (a relatively well-researched age group) but also for older (i.e., secondary and college) students (See Katz, 1971; Astin, 1968).

b. School and Institutional Characteristics. Such variables as numbers and training of staff, professionalization of administrators and faculty, curriculum content, mode of presentation, grading and advancement criteria, size and governance of schools or universities, per-student expenditure, amount and type of supportive services, and physical and social climate within an institution have all been investigated as to educational impact. Generally, no clear causal relationships between school inputs and educational outputs are apparent despite a considerable body of research.

c. Characteristics of Home and Community. The socioeconomic status of parents and of the surrounding community, the expectations and education of parents, the character of formal and informal community structure (supportive, antagonistic, or non-existent), and in particular the attitudes of peer groups (acceptance or rejection of school learning) serve to enhance or work against attainment of educational objectives. At higher educational levels, the influence and learning taking place from peers may in fact be as important as what goes on in the classroom (See Blackburn, 1968; Feldman and Newcomb, 1969).

d. Effects of National and International Events. After the 1960's, there can be little question that major currents agitating the world beyond school and campus deeply impinge on them. (See, for instance, the Carnegie Commission Report, *Dissent and Disruption*, 1971.) The war in Viet Nam, the Civil Rights movement, and heightened awareness of the environment not only disrupted education but affected both its substance and form. Many current issues are traceable to national and international concerns and will continue to seek expression within as well as outside the educational system. Such issues include demands for

increased relevance of formal schooling to the real world, alienation from social institutions including those of education, decreasing tolerance for traditional authority structures and resulting demands for decision-making power, and loss of belief in the efficacy of rationality (i.e., the tools of the intellectual community and the university) or the political process (i.e., exercise of traditional citizen participation) to solve problems.

3. Constraints

a. Educational Policy-Making. Concern over the aims and achievements of education emphasizes the need for understanding how the schools are run and who runs them. There are variations on the general pattern of educational control, but in essence, the formal structure is based on state constitutions and statutes, and the latter have tended to confirm the historical development of education in the nineteenth century, especially in one respect: the district system of organization.

The Federal Constitution grants the states responsibility for the provision of public education. The authority over education belongs to the state, and the legislature of the state has broad discretion in the determination of goals and the enactment of laws designed to achieve these goals. Generally, school districts, clearly recognized as quasi-corporations, are responsible for the execution of state educational policy; therefore, actual school operation is largely a matter of local responsibility (Hack, 1971).

Autonomy of operation for each of the three levels of educational government (federal, state, and local) is embodied in federal and state laws. But in practice these autonomous levels of educational government interact and have a system of mutual obligation and dependence. Bailey and Mosher (1968) depict the influences of educational policy-making in the United States by a simplified grid showing potential interaction (See Table 2). They stress that cutting across their grid are the "pervasive influences of various ideologues and journalists, and of the producers of textbooks and educational hardware." Only 6 of the 21 boxes include national influence. Boxes 2, 5, 6, 12, and 21 are likely to be more influential in the making of educational policy than boxes 1, 7, 10, 16, and 19. Bailey and Mosher conclude that educational policy increasingly is bound to reflect the extended interaction of all levels and types

TABLE 2: INFLUENCES ON EDUCATIONAL POLICY-MAKING
IN THE UNITED STATES

	<u>National</u>	<u>State</u>	<u>Local</u>
General Legislative	(1) Congress	(2) State Legislature	(3) Common Council
Educational Legislative	(4) President	(5) State School Board	(6) Local School Board
Executive	(7) President	(8) Governor	(9) Mayor
Administrative	(10) HEW-USOE	(11) State Dept. of Education	(12) School Superintendent
Judicial	(13) Supreme Court	(14) State Supreme Court	(15) Federal or State District Court
Professional Interests	(16) NEA	(17) State Teachers' Association	(18) Local PTA
Other Private Interests	(19) U.S. Catholic Conference	(20) State Chamber of Commerce	(21) John Birch Society Chapter

Source: Stephen K. Bailey and Edith K. Mosher, *ESEA: The Office of Education Administers a Law* (Syracuse: Syracuse University Press, 1968), p. 222.

of government and of a wide variety of private and professional forces.

This supports Koerner's (1968) thesis that authority and influence are widely distributed in education and are exercised in ways that do not lend themselves to precise analysis. Riesman (1956) identifies and examines the enormous variety of pressures on the schools, from their domination by the upper social strata to their partial control by the previously underprivileged and their relative freedom amid the competing pressures. In response to these pressures, schools resort to organizational devices and public relations in order to affect attitudes and patterns of consensus in the district and preserve some freedom of action.

The most important contribution of the American people to educational advance was the general establishment over a century ago of a tax-supported school system free for all children (Carlton, 1965). During the nineteenth century, state mandates became strengthened and enforced by state educational agents. From compulsory teaching, state law moved to require school buildings, compulsory supervision, compulsory school attendance, and finally certification of teachers.

Challenges to the system of universal free public education as it now operates are evident from the increasing number of court cases on provision of funds, support of private institutions, and control. These cases raise issues of deprivation of constitutional protection or violation of statutory requirements for equal educational opportunity. Court decisions have affected the operation of the schools in such areas as hot lunches, student rights, vocational education, racial integration, fiscal dependence, per pupil expenditure, teacher salaries, and school facilities. The National Organization on Legal Problems of Education (1969) states that the drift of judicial opinion and the law will require more and more rigorous notions of basic equality within a school district in every possible facet of the educational process.

b. Political-Social Constraints. The distinction between the ritual and the reality of power in public education is obscured by reciprocal relationships between leaders and constituents through which constituents exert a good deal of indirect influence on the decisions of leaders. The number of citizens who participate directly in important decisions bearing on the public schools is small, with direct influence over decisions in public education exerted largely by public

officials, but these individuals and groups are not autonomous since they need to gain or retain popular support.

Decisions concerning facilities—chiefly school buildings—are made very largely in the districts. A comparatively high degree of public participation is involved for two reasons. First, in nearly all states the bond issues which such capital outlays necessitate are by law subject to popular approval. Second, buildings being tangible and the distance a child must walk or ride to school being measurable, most people feel qualified to have opinions about the size, location, looks, and costs of school buildings (Rosenthal, 1969).

School boundary decisions also tend to arouse great citizen participation and are often the subject of emotional reaction and intense debate, in contrast to decisions about what actually goes on inside schools. This would tend to indicate the high priorities placed by parents on the custodial and socializing functions of school, though concerns for performance on academic goals often enter such debates.

The propagation of the myth that "schools should be kept out of politics" was based in part on the belief that a close alliance with either a party or a faction might be disastrous to the long-range fortunes of a continuing educational enterprise. Yet, "education is one of the most thoroughly political enterprises in American life" (Bailey, 1962, p. viii), with nearly everyone holding an "expert" opinion. The problem of identifying the bases for differing points of view is often complex and difficult, but failure to understand the politics of education is likely to result in a general inability to cope effectively with problems of education.

In higher education, patterns of decision-making are shifting as students and—in the case of public institutions—the public have demanded more voice. Often the demands from these two client groups affect each other adversely as student expression turns some segments of the public against higher education, with resulting budget threats played off against campus disruption.

A less visible but strong control on higher education is exercised through the demands of the labor market and the needs of the professions. These pressures make it difficult to change grading practices, screening and credentialing (e.g., degree) mechanisms, and the

criteria for accreditation of departments and professional schools. Yet new social priorities imposed on institutions may make such changes mandatory, as in the case of externally set open admissions policies which put their own—and quite different—constraints on the academic policies of an institution.

c. Economic Constraints. Financial decisions regarding public schools traditionally have centered in the districts. But the ways in which decisions are made are fixed by state laws and often profoundly affect the decisions themselves. Thus, in one state a school board may have final approval over a budget which increases the property tax rate; in another the tax increase must be approved by the voters; in a third the budget itself is the subject of a popular referendum.

The 1970 National Educational Finance Project (NEFP) maintains that taxpayer attitudes are subject to some manipulation, and investment in persuasion is profitable in the public economy as it is in the private economy. The very intangibility of the benefits produced by public services of many varieties, including education, makes swings in taxpayer attitudes wider than they would be for services that individuals can measure more directly. The main reasons for the "taxpayers' revolt" in the late 1960's and the early 1970's, which is by no means limited to educational financing, are (1) the post-1965 inflation, and (2) increased selectivity in public programs (Johns, *et al*, 1970). The NEFP predicts that the erosion of taxpayer support for public education may continue into the 1970's. Taxpayers, witnessing a comparatively staggering increase in their taxes in recent years with neither discernible evidence of improvement in results nor clear explanations for what the expenditures are intended to accomplish, increasingly reward this "lack of account" by rejecting local school tax levies.

New school aid legislation may help to readjust state and local tax burdens and provide relief for particularly hardpressed taxpayers who have come to resent local taxes whose only base is real property. Lawsuits challenging school finance systems, similar to the *Serrano vs. Priest* case, have been filed in over twenty states challenging the constitutionality of state aid formulae and reliance on the property tax (Lawyers' Committee for Civil Rights Under Law, 1972). A Presidential Commission on School Finance (1972) has recommended state assumption of school finance. In almost every state, there is a wide disparity in the resources of local districts that bears no relationship to local taxing effort, costs, or educational need.

Bailey (1962) states that where increased expenditures for a public function are substantial, taxpayer and local official pressures will tend to force a higher level of government to absorb a proportionate or increased share of the cost of that function, and that this will be true in spite of habits or myths of local control and local responsibility. Public demands in such fields as welfare, health, and highways have tested this proposition. In the field of education, economic, religious, and local political pressures are combining to shift tax burdens upward.

The spiraling costs of higher education documented earlier and decreased funding—whether by alumni giving, state legislatures, or federal support—have combined to put serious financial constraints on colleges and universities. A recent Carnegie Commission report (1971) estimates that half of the private four-year colleges and universities are operating with deficits, and two-thirds of all institutions, public and private, are in or headed for grave financial difficulties. Likely victims are innovative programs, the desire of young (untenured) faculty members to concentrate on teaching rather than research, and support and remedial programs necessary to make new open admissions policies work.

III. THE PROBLEMS OF EDUCATION

To ask whether education is in trouble today is to pose a rhetorical question. Criticisms of the gaps between expectation and performance abound, and since everyone is or has once been part of the enterprise, nearly everyone is an instant expert. Critics agree on neither the problems nor the remedies, but they concur

that educational goals are not being met. What are the indications that this is indeed so? A more detailed examination of specific problems is made in Chapters IV, V, and VI; this Chapter merely notes some evidence in the most serious areas of failure.

A. Evidence of Failure

1. Academic Learning

a. Substance. The 1960's saw concentrated effort to reform course content and instructional methods. Many individual school sites and teachers truly upgraded the subject matter, knowledge, and problem-solving ability of their students as indicated by subsequent changes in introductory college courses, particularly in the better institutions. Yet, observations from all over the country indicate small improvement in the system as a whole. Goodlad (1969) observed 260 classrooms in 100 schools in or around major cities in 13 states to document specified characteristics of educational reform. He found no distinction in practices between urban and suburban schools and little evidence of reform measures in any of the schools. He concluded that "much of the so-called education reform movement has been blunted on the classroom door." In many schools, course offerings do not include subjects of major importance; for example, 80% of high school students do not study economics, and only 40% of the schools even offer an economics course. A recent in-depth study of junior high schools by Smith and Geoffrey (1968) makes it clear that intellectual tasks receive low priorities in the daily business of the school.

b. Achievement Scores. The failure of the system to provide poor and minority students with basic academic skills is overwhelmingly apparent. Calculations from the surveys conducted by Coleman and reanalyzed by Mosteller, Moynihan, *et al.* (1972) indicate that

average scores of poor Negro children in urban slums cluster around the 25th percentile of the whole nation. In terms of grade level, by grade 3 the typical black child is half a year behind, a year and a half by grade 6 and three years by grade 12. . . . For 12th grade Negro students throughout the nation, only 16 per cent were at or above grade level. Similar results hold for Puerto Ricans, Mexican Americans, and American Indians.

The problems are not confined to the poor, however. Myers (1970) states that "between 8 and 12 million children are considered to have reading difficulties so severe that they are headed toward functional illiteracy."

c. Drop-Out Rates. While failure to stay in school may be due to a combination of reasons, one of

major importance is the inability to perform at expected academic levels. This, in turn, is due to earlier schooling deficiencies. Poor and minority group students drop out at a higher rate, but the absolute number of students from non-poverty areas who drop out is greater. The Bureau of the Census reports that there are 9 dropouts from non-poverty areas to every 5 from poverty areas in metropolitan regions. However, 16 to 21 year-olds from families with incomes of \$3,000 or less make up 25% of the total dropouts but only 7% of all graduates; and only 40% of poor 16-21 year-olds (\$3,000 or less family income) are high school graduates compared to 84% from non-poverty families (\$7,500 or more) (Department of Labor Special Report 121).

2. Social and Individual Development

Failures in these areas are somewhat harder to document, since few if any assessment and evaluation techniques available are capable of yielding reliable information. One can, however, draw conclusions from observations of standard practice and attempts to introduce countervailing approaches, inside or outside the system.

a. Non-Traditional Instruction. The usual elementary classroom is so organized as to have each child work by himself on a task identical to that assigned to the 23 others in the room with him. This discourages both social interaction and any expression of individuality. Open school classrooms are an obvious attempt to encourage learning in groups, as are project-focused assignments. Activity centers where mathematics (or reading, or art) instruction is available on an "as wanted" basis are intended to foster individual exploration and creativity. The high level of interest in such innovations shown by popular media (writings by Featherstone, Silberman; documentaries on television), parents, and "good" schools—even threatening to create a wave of fads—indicates the degree of dissatisfaction with current school performance in terms of social and individual development.

b. Alternative Schools. The growth of alternative schools and new patterns for higher education again point to the dissatisfaction with traditional methods of teaching how to be an autonomous but contributing member of a myriad of social settings. Graubard in a directory of new schools (1971) estimates that more than 15,000 students and 3,000 teachers are involved in 400 to 450 experimental or free schools. In addition, there are alternative schools

designed and run by students and teachers within systems. Divoky (1971) cites over 50 in existence as of last year; there are at least double that number now. At the higher educational level, the Union of Experimenting Colleges and Universities reports more than 100 experimental college programs.

c. Antisocial Behavior. Where schools and school staff have divergent values from home and neighborhood, children's assimilation of appropriate social skills is inhibited by conflict and rejection. Vandalism, truancy rates, drug abuse, criminal behavior are all indicative of failure in learning social skills and are more prevalent where value conflicts are at their sharpest. In inner cities, the daily truancy rate is averaging around 30% and often is as high as 60% (*Newsweek*, April 3, 1972).

d. Youth Subcultures. The creation of subcultures around peers is strong evidence that traditional institutions designed to socialize the young (particularly educational systems) are failing to meet their needs. Dropout rates can be ascribed to this failure as well as to lack of academic adequacy.

3. Career Education

Sidney Marland, Commissioner of Education, has commented on the fact that about one-third of all students pass through high school via the general education curriculum, "a type of education which leaves its graduates neither trained for a suitable skill nor qualified to pursue higher education" (Career Education Task Force Working Paper, 1972). The problem is amplified for the poor and for minorities. Fifty per cent of the young adults who are unemployed cannot read well enough to hold a job requiring reasonable skills (Myers, 1970). According to Myers, the proportion of jobs for unskilled workers has fallen from 30% (25 years ago) to 17% in 1970 and is expected to be only 5% by 1975; hence, this problem is likely to become more severe. A recent national survey by Eninger (1968) found that the majority of graduates of occupational training programs did not enter the trade for which they were trained. Though women are now 38% of the labor force, one-half are in 21 out of 250 occupations identified by the Census Bureau, one-fourth in 5 categories, all relatively low-paying (secretarial, waitress, domestic, bookkeeping, and elementary school teaching). Schooling can make a difference, since there is correlation between years of schooling and income (See

Table A-8 and Figure A-4), but the causal relationships between the substance of instruction (as contrasted to obtaining a high school or higher degree) and career performance are far from clear.

4. Equality and Access

a. Fiscal Equality. The degree to which traditional methods of financing school education are inherently unequal is currently being tested in the courts. *Serrano vs. Priest*, the first of the test cases, documented that Beverly Hills in one recent year paid \$2.38/\$100 school tax and spent \$1,232 for each elementary school pupil; Baldwin Park paid \$5.48/\$100 but could afford only \$577 per pupil. While relationships between amount spent and quality of education are a matter of controversy, proponents of equalization argue that the poor should at least have an equal opportunity to be disappointed.

b. Educational Equality. Inequality among states is evidenced by percent of draftees who failed mental tests in 1968. While the nationwide failure was 8%, Mississippi had a failure rate of 25.4% contrasted to Minnesota's 1% and Rhode Island's 0.6% (*Digest of Educational Statistics*, 1970).

Inequality of education arising from racial and social segregation patterns has been documented in many ways from *Brown vs. Board of Education*, Topeka, Kansas, to the extensive recent review of Coleman's original data. While the evidence is irrefutable, the means for amelioration advocated and tried vary as widely as the diagnoses of causes (See Jensen, 1969; Bayley, 1969; Golden and Birns, 1968; Deutsch and Brown, 1964; Birch and Gussow, 1970; Freeberg and Payn, 1967; Kohl, 1967; Kozol, 1967; Rosenthal, 1969), from increasing resources for schools serving the poor and minorities (See ESEA Title I Legislation, 1965; Fleischmann, 1972), to intensive preschool education (with *Sesame Street* and the Bereiter-Englemann approaches as extreme poles in methodology), to altered school attendance patterns in order to achieve different social and racial mixes.

c. Access. Access is closely related to equality. For instance, the likelihood of attending college is related to both sex and income. In 1970, nearly 40% of 21 year-old males were enrolled in school, but only 20% of 21 year-old females (Census Bureau Reports). Only 53.3% of high ability females from poor

families enter college, compared to 99% of the high income, high ability males (Project Talent). (See Tables A-7 and A-10.)

A number of groups have need for but no ready access to education; for instance, pre-school children, home-bound women, old people. Of these, the most crucial is perhaps the first group because of relationships between characteristics of the entering learner and effects of school. There are 23 million children below 6, most of whom are not in any kind of educational facility. Of these, 3 million are poor and 2 million are on Aid to Dependent Children (ADC).

5. Productivity

Costs of education have been rising disproportionately even compared to other service industries, averaging 10% per year over the last two decades, an increase from 3.4% of the GNP in 1950 to 7.1% in 1970 (See Table 1). From 1955 to 1965, while school enrollment increased 37%, prices for goods and services purchased by schools increased 48%. This compares with an increase of 35% (while population served increased by 22%) in the prices paid by all other public services including health and hospitals, public welfare, highways, and urban services. Productivity as measured by school attendance has decreased by 2.5% per year since 1950. Productivity in higher education has also declined or stayed static when measured by cost of weighted credit hours (See Table 7 and Figure 4). Costs per credit hour have quadrupled over the last 40 years and are projected to increase with a doubling time of about 12 years in private colleges and 20 years in public institutions.

6. Responsiveness

Dissatisfaction of those who support schools and those who work in them is becoming increasingly evident. According to the Investment Bankers Association, success rate of school bond issues dropped from 89% in 1960 to 48% in 1970. In New York City, 146 public school principals (out of 900 in the whole system) have opted for early retirement this year, as compared with only 26 just two years ago (*Newsweek*, April 3, 1972).

Advice by teachers and counselors to parents of bright or bored children generally consists of suggesting private schools. The Serrano family's experience in this

regard is unusual only in that these parents were not content to join the school staff in giving up on the schools altogether. The creation of alternative schools outside the system and free universities is also an indication that existing schools and institutions are not responsive to some client groups.

7. Coordination

The preceding paragraphs have cited evidence for failures in meeting the end goals of education and also in the processes by which the educational enterprise is conducted. These failures impinge strongly on other societal institutions: academic failure leads to underuse of human talent; lack of adequate social and interpersonal skills leads to family failure, inadequate ability to deal with the regulatory and social service mechanisms of society, and poor participation in the processes of representative government; inadequacy of career skills causes family hardship, imposes increased burdens on the welfare system, and is related to such dislocations in the labor market as unemployment and underemployment; inadequate personal development may lead to dissatisfaction and resulting antisocial behavior such as crime or violence against self, ranging from drug addiction to suicide.

Failures in the facilitating goals are even more important in terms of impact on other social institutions because of the pervasiveness of the educational enterprise and its strong connection to other components of society. Thus, lack of equality of opportunity and access determines and reflects the same failure in other institutions; since educational institutions involve or have at one time involved nearly every individual, inadequate responsiveness in its institutions conditions people to expect similar treatment from other segments of private and public business, leading to cynicism and alienation; and the ever-increasing costs of education raise questions about resource use in other social services.

B. Priorities for the National Institute of Education

Scanning the domain of education (needs and expectations, quantitative parameters, determinants and constraints, and current problems) makes it clear that educational goals are not being met in the following ways:

1. Quality of Education

While the majority of children emerge into adulthood with a modicum of academic and social skills, these often do not meet the requirements for further education or careers considered desirable, whether by the individual, his parents, or society. Nor are many adolescents and young adults adequately equipped to derive reasonable satisfaction from their own lives or their relationships with others and their interactions with the larger community. Thus, alienation and cynicism become growing characteristics. Therefore, NIE must have as a major goal:

IMPROVING THE QUALITY OF EDUCATION

2. Education for the Disadvantaged

Poor and minority group children suffer from all the failures of education that children of middle and upper income families do. They are further handicapped, however, because schools often are not able to provide them with the academic, social, career, and attitudinal skills required to assess society. This failure leads to economic and social dislocation, thus diminishing not

only individual lives but society as a whole. Therefore, NIE must have as a second major goal:

IMPROVING EDUCATION FOR THE DISADVANTAGED

3. Use of Resources

The processes by which education is provided do not exhibit the characteristics necessary for adequate functioning. Inequalities persist; a number of groups have educational needs but inadequate access to channels of education. The system is not responsive to the people it serves because its clients are only marginally and often-particularly in the case of the poor—not at all involved in decision-making. Productivity has been declining, while costs have been increasing. Therefore, a third major goal for NIE is:

IMPROVING RESOURCE USE IN EDUCATION

The next three chapters will analyze these priority areas in detail in order to establish specific subgoals, examine relevant knowledge and work, and derive initiatives for research and development.

IV. IMPROVING THE QUALITY OF EDUCATION

A. Problems

To develop a rational strategy for improving the quality of education, one must first examine the performance of education and its failures in the context of individual and societal expectations. These expectations, discussed in Chapter II, compose the criteria against which educational quality can be assessed. Such assessment is not an easy task, since evaluation techniques for non-quantitative expectations are not well developed. Nevertheless, observation of current practice does reveal certain areas in which individual and societal goals are not being achieved. These areas are discussed below as a series of specific problems within major goal categories. Although problems are ascribed to specific goals for purposes of analysis, they also have impact on other goals; the process of categorization was one of emphasis, not of exclusiveness (See Davis, 1971).

1. Academic and Career Goals

a. Obsolescent Content. The most current theories or constructs within any academic field are usually not an integral part of classroom presentation at the elementary and secondary level, while in vocational courses outmoded procedures or obsolescent equipment can diminish the cogency of much of the instruction. In addition to obsolescence within courses, one can also document a degree of obsolescence in the kinds of courses offered: in many secondary schools, course offerings do not include such important subjects as economics or psychology. The academic department structure in schools and universities often serves to perpetuate obsolescence in the organization of content as well. Powerful new fields of interest such as ecology or public policy are thus diffused through the traditional structure.

b. Inappropriate Content. Even if the content is substantially current, it is often not an appropriate engagement with the discipline: knowledge is not perceived as a process, but rather as a collection of facts. Meaningless formalism is the hallmark of much instruction. Students are able, after suitable drill, to recite facts, but are unable to use those facts to build theories or draw conclusions. Indeed schools are not notable for dealing with process of any variety whether it be carrying on a conversation in French, playing the guitar, or carrying out an independent exploration in science.

Related to the inappropriate choice of content is an inappropriateness in time of presentation. Much of the work of Piaget (1968) and others indicates that individual children encompass wide variation in their readiness to deal with various learning situations. Yet schools traditionally base their assessment of content appropriateness on chronological age alone.

c. Complex Skills. As has been pointed out, the schools' responsibility has been enlarged far beyond imparting rote knowledge. They must also teach coping, persistence, flexibility, the making of realistic choices, creativity, self-reliance, all the attributes that go into the analyzing and solving of problems. Kinglsey Davis (1944, p. 8) states that often the student leaves school or the university "with a hoard of abstract knowledge, but with little knowledge of the concrete situations he must negotiate in order to get along." In the academic disciplines, curriculum critics note that creative flexible approaches are not fostered.

Rarely indeed is the challenge one of modifying a given procedure so as to adapt it to situations which depart in a few respects from the known and standard form of a problem. Even rarer is the opportunity to discover that there are related or neighboring problems for which we have no ready methods of solution (Schwab, 1962, p. 25).

d. Passive Learning. "Action possibilities are more and more encapsulated in formal work organizations from which the young are excluded . . . thus it can well be said that society has become 'action-poor' for the young" (Coleman, 1972). Schools do not often temper the ineffectiveness that many students consequently experience. The passive mode dominates much of formal education in this country. The lack of opportunity to take effectual action and

learn through the consequences of that action can create a listless dissatisfaction with academics and an early desire to join the real world. At the university level, students who do not have the opportunity to participate in a professor's research or work with a graduate student often experience this same dissatisfaction. Bronfenbrenner (1970) contrasts this with experiences in other countries in which schools provide their students with opportunities to do paid work for business and industry during the school day as early as the fifth grade (See also Raizen, 1972).

e. Lack of Diversity. The goal of universal education in this country is being actualized as the same kind of education for everyone. Goals of citizenship and education for a mobile population, though important in themselves, have become the vehicle for over-homogenizing education. The same school organizations are to be found in every country. All students must begin school at six and must stay in school until fourteen or sixteen. With a few encouraging exceptions, higher education is also allocated a fixed time interval in the sequence of life. The cementing of the time for education by fixing both the time of entry and the duration of instruction continues in the face of mounting evidence that ability and motivation mature at different times in different individuals. Within this fixed structure of formal education, one finds predictably similar personnel and instruction. The same textbooks are used in Oregon and Mississippi, and local or regional culture are treated only as enrichment topics. Measures of success within the formal system also reflect this lack of diversity.

2. Social and Individual Development

a. Separate Youth Culture. The formal educative process in this country reflects the assumption that placing a group of students with a single adult or authority provides the best system for learning. This separation of students from a wide variety of adults has a number of undesirable consequences. The absence of viable alternative adult role models leads to a narrow view of adult society on the part of students and to the creation of a separate youth culture which further serves to reinforce the students' status as economically marginal. Young people who have few adult role models to influence their thinking or behavior turn to their peers for the creation of their social norms and values. Anthropologists (Whiting, 1971) have provided convincing evidence of the power of the peer culture in affirming or denying the value of schooling.

b. Daily Lives are Dull. Much of the school day in elementary and secondary school represents a large amount of wasted time for many students. Jackson (1968), Smith and Geoffrey (1968), and others have documented the fact that when twenty or thirty people are expected to do the same thing, there must be a large amount of waiting in line, waiting for a moment of the teacher's attention, or just doing nothing. Particularly in the lower grades the requirement that students must ignore their companions to concentrate on their own work dampens much of the excitement and curiosity in a student's day while inhibiting the development of interpersonal skills. At the secondary level, one of the incongruities in many high schools is that those students who take the fewest courses are assigned the largest number of study halls. Presumably because higher education is not expected to perform the same kinds of custodial care as grades K-12, dullness and boredom should not be an issue. One does, however, hear these complaints leveled at lectures and courses, particularly required courses, within the system of higher education. The growth and content of student-produced guides to university courses provides much evidence as to the lack of challenge and stimulation, not to say boredom, induced by many of these courses.

c. Hidden Curriculum. Critics of elementary and secondary schools have documented a covert value structure which rewards students for passivity, conformity, and even dishonesty. A report on student adaptation to the academic environment at MIT documents a similar covert structure: "The (invisible) curriculum appears to separate those students who take intellectual risks from those students who do not and to reward those who do *not* take risks" (*Educational Research Center*, 1969, pp. 7-8). This report then poses three questions relevant to the hidden curriculum at all levels of education. "Does the educational institution ask the student to limit his adaptive potential in order to give him an A? Do the institution's demands run counter to the developmental tasks of adolescence? Can the student do well in school and still develop, for example, the ability to take informed intellectual risks?"

The on-going business matters in all elementary and secondary schools often create situations that unintentionally and perhaps unavoidably illustrate a disordered sense of priorities. PA interruptions about an improperly parked car, clerical interruptions to fill out insurance forms, unscheduled fire drills, vision tests, all

indicate a certain disregard for the instruction process. This disregard teaches the student that society holds academic goals in rather low regard, a socialization process in direct conflict with professed ideals of education for education's sake.

In addition to an inherent value and priorities structure, schools and universities often provide students with adult role models incongruent with the development of positive academic and attitudinal skills. The professor who is more interested in publishing than in teaching, the white middle class teacher in an inner city school who continually reminisces about how much better the school was in the past, or any teacher who is not deeply and honestly involved with his subject all teach their students more than just "subject matter."

3. Responsiveness

a. Students as Non-Citizens. Recent court cases have raised the issue that schools do not respect students' constitutional rights. Dress codes, locker searches, distribution of leaflets, all have been the basis of court suits. And, of course, the court cases are the exceptions; student rights are violated daily. Corporal punishment in the public schools is permitted in 49 states, and schools "are the last place in this country where one can be beaten" (Hentoff, 1971, p. 63). Clearly students learn about citizenship and democracy from these incidents.

Toward the end of last year, the Center for Research and Education in American Liberties at Teachers College, Columbia University, surveyed the attitudes of nearly 7,000 American students. The Center concluded that most of the clashes and tensions in junior and senior high schools are in reaction to the ways in which these institutions are governed. The great majority of the students, says Dr. Alan Westin, director of the center, are angry, frustrated, increasingly alienated by school. They do not believe they receive individual justice or enjoy the rights of dissent or share in critical decision-making affecting their lives within the school. Our schools are now educating millions of students who are not forming an allegiance to the democratic system in their daily lives in school (Hentoff, 1971, p. 74).

b. Confusion Over Priorities. Even when parents, students, and educators agree on the goals of education (see Chapter II for a consideration of goals-conflict), there is often disagreement over the means to these goals or the priorities for action. The confusion frequently becomes most pressing over discipline or social issues such as drug abuse or sex education at the elementary and secondary level. At the higher education level one can identify four major groups who have enough power to influence priorities: the faculty, the administration, the students, and the public. This listing, on the average, represents the order of each group's relative power, although there are variations from institution to institution, faculty dominating the most prestigious schools, administration or the public (through legislature, boards of regents or trustees) some of the others. But even the weight of this dominance does not remove the symptoms of paralysis, for the faculty can no more put forth consensus and coherent priorities than can the institution. Faculty conflict can be seen in the furtherance of knowledge vs. the transference of knowledge, contribution to the discipline vs. contribution to the institution and/or to the community, and self-advancement vs. service to students. The administration conflict usually occurs between efficiency and effectiveness. Student conflict centers around career preparation vs. learning for learning's sake and social needs vs. academic demands.

c. Powerlessness of the Constituencies. As the Columbia study indicates, students do not believe the system allows them to share in decisions affecting their lives. Parents and students feel that they are unable to get serious hearings from school personnel, that reasonable requests are not acted on or that responses are token, misdirected, or ineffective. Teachers are often troubled by the "remote-control" nature of administration. And even principals feel manipulated and frustrated by "the system." Sarason (1971) documents this lack of control and attributes at least a part of it to a fragmenting of readily available information about any part of the system. Recent events in Chicago, where current school deficits are blamed on the superintendent but were actually caused by the mayor's decision on teacher salaries (*Newsweek*, April 3, 1972), indicate that even the highest education officials may suffer from lack of power.

d. Isolation From Informal System. The fixed time and duration of the formal system discussed earlier serve to isolate those inside that system from

those outside it. Although there are almost as many people participating in instructional activities outside the formal system as inside it, the recognition afforded these activities is minimal. Consequently many people who have instructional needs may not know where to turn. The conception of education as something that happens to people between the ages of six and eighteen or twenty-two creates unnatural barriers between learning and life. These barriers are reinforced within the formal system. Many schools and colleges view community resources merely as potential field trip sites or sources for guest speakers. Students are not instructed in ways of taking advantage of community resources, nor are activities pursued through these resources considered creditable learning by the schools.

Having described the problems that must be addressed in order to improve the quality of education for everyone, one can articulate potential suggestions for their improvement or amelioration. Obsolescent and inappropriate content that prevents the full development of academic and career skills requires the provision of rigorous intellectual challenge for all students. Passive learning, boredom, and the lack of opportunity for students to develop meaningful "coping" skills limit the attainment of attitudinal and career goals and require the development of opportunities for students to initiate and experience effectual action. Conformity in educational structure and experience must be confronted by an effort to provide alternative and diverse modes of education. Negative aspects of the separate youth culture and the separate school culture that lead to a diminished development of all the educational skills must be countered by programs to reduce the isolation of schools from the real world. The hidden curriculum that impinges on all aspects of student development should be dealt with through the creation of learning environments explicitly suited to positive individual and group growth. Finally, all of the problems indicate the pressing need for a thorough reexamination and articulation of the goals and a better understanding of the processes of education.

Because these problems are part of a complex network, every suggestion for improvement addresses more than a single problem, and the suggestions are themselves interrelated. For example, opportunities for students to experience effective action cannot be developed in isolation from the real world, nor should diverse educational experiences be developed that do not incorporate rigorous intellectual challenge. Keeping in

mind the interrelated nature of these suggestions, it is possible to articulate the following sub-goals to improve the quality of education:

1. Provide rigorous intellectual challenge for all students;
2. Expand opportunities for students to experience effectual action;
3. Reduce the isolation of schools and students from the outside world;
4. Develop educational diversity;
5. Encourage individual, community, and national articulation of the goals and processes of education.

B. Sub-Goals by Target Groups

Although all of the above sub-goals are related to the entire population involved with education, some of the sub-goals have a higher priority for one portion of the target population than for another.

1. Elementary School

a. Diverse Approaches to learning.

Particular attention to individual differences is necessary at this level to match learning situations to the characteristics of the entering student.

b. Rigorous Intellectual Challenge.

Elementary school particularly tends to emphasize rote memorization, low-level skills, and trivial substance. Knowledge as a process and as a tool must become part of the curriculum to involve students in interesting and challenging material.

c. Opportunities for Effectual Action.

Though these will have to be provided primarily within the classroom, they are important to young children in order to teach problem solving and develop adequate self-concept.

2. Secondary School

a. Opportunities for Effectual Action.

These opportunities should be provided both in the school and in the community to increase the student's sense of responsibility and prepare him for full entry into the community.

b. Rigorous Intellectual Challenge.

Development of complex skills and challenging

engagement with academic disciplines are necessary at the secondary level to prepare the student for effective entry into society and/or post-secondary education.

c. Reduce Isolation from Non-School World. The physical and intellectual separation from the real world, which the high school student feels acutely, should be bridged through his involvement in a thorough study of those social institutions that impinge upon all citizens as well as through the action programs suggested in (a) above.

d. Diverse Approaches to Learning. In addition to continuing attention to individual differences, it is necessary at the high school level to develop viable alternative programs in order to help reduce the emphasis on the single standard of success (i.e., college entry) that is not appropriate for all students.

3. Higher Education

a. Diverse Approaches to Learning. An increasing interest in the benefits of higher education on the part of individuals unwilling or unable to devote four consecutive years of full-time study to it indicates the need for development of alternative approaches to degree programs as well as to continuing education.

4. Educational Systems

a. Reduce Isolation. To reduce the level of disaffection and improve performance on the part of both staff and students, it is necessary to create better channels of information within the system and easier access to the world outside the system.

b. Articulate Goals and Processes. The lack of available information on high-quality existing programs that impedes further adoption of those programs needs to be overcome. In addition, a better understanding of the goals and processes of education on the part of all concerned is of fundamental importance to any concerted efforts in improving the quality of education.

C. Current Status of Experimentation and Development

The problems discussed above are not all uniquely a creation of the seventies or even of the sixties; the extent of their ubiquity is reflected in an examination of

a number of the assumptions that have undergirded much of the educational development in the past fifteen years as they relate to the subgoals for improving the quality of education. The examination carried out in this section includes a statement of each assumption, a brief discussion of the development work related to each assumption (though in no way an exhaustive listing of all relevant work), followed by an indication of the kinds of questions that still remain unanswered and that therefore impinge upon the analysis of current problems and the achievement of the specified goals.

Subgoal No. 1: Provide Rigorous Intellectual Challenge for all students.

a. Course Content is Not Sufficiently Exacting and Stimulating. The major variables affected by this assumption are textbooks and other curriculum materials, teacher preparation and behavior, and classroom organization.

Mathematics curriculum reform and the physics course prepared by the Physical Science Study Committee were the first national responses to this assumption (Goodlad, 1966). Curriculum development projects involving outstanding university scientists and mathematicians designed courses to incorporate the intellectual rigor of the field and offer the high school student a dynamic view of the discipline. Elementary science curricula continued this mode and also began a heavy emphasis on involving the student in active experimentation or hands-on learning. (See, for instance, the description of the Science Curriculum Improvement Study by Karplus and Thier, 1962.) Recently this mode has been continued by various professional associations in the social sciences (See National Science Foundation, 1970; Lockard, 1970).

Although the intellectual quality of many of these projects is highly praised, their success has not been total. The cost of some programs placed them out of the range of over-strained school budgets. At the high school level the high-powered programs cannot be easily adapted for the average student. (Adherents of these programs argue, however, that their aim never was to produce low-cost materials for all students.) Sketchy evaluation of the impact of these curriculum projects indicates that the farther one goes from the actual developers the more the curriculum becomes diluted (See Goodlad, 1966; Lastrinos, 1969; Sarason, 1971; Squire and Applebee, 1968; Watson, 1967). Several of

the projects encompassed a teacher training component; some attempted to prevent or remedy the problem of ill-prepared teachers by involving them in the development work. But the problem still remains that those teachers who are not deeply engaged with a particular curriculum do not often become involved merely through receiving a new set of books and teachers' manuals.

The existing body of high quality curricula is sufficiently great in many areas and the capability of such agencies as NSF sufficiently well-established that the support of curriculum development for specific courses is not of high priority for a new education agency. A logical next step, however, would be the development of ways to install and maintain this material in the majority of appropriate classrooms across the country and to support integrative approaches across traditional disciplinary lines. Challenging materials also need to be developed for non-academic students or students with need for, but no interest in, particular subject matter. An appropriate next step would be the determination of the most effective ways of developing and fostering the use of such materials.

b. Schools Could Better Reinforce Learning. The primary variables involved in programs based on this observation are classroom organization, course-content presentation, and teacher behavior.

Classroom applications of reinforcement theory seem to be most prevalent at the lower grade levels. The Englemann-Becker model was used in at least twenty Follow Through district programs in 1970-1971 (USOE *Follow Through* 1972, p. 21), and many other systems employed modifications of this model. The Skinnerian teaching machines and spin-off programmed learning texts provide reinforcement through immediate feedback and have been used in a few university settings, primarily to teach introductory language courses (See Appendix B for a more detailed discussion of educational technology).

Reinforcement through token economies is applied in both elementary and secondary schools (Krasner, 1971). Various performance contractors use this method in which a student is given cash awards or tokens redeemable for merchandise for high academic performance. Critics of this approach believe that this extrinsic reward system gives the student an inaccurate impression of the value of learning.

Much of the research in learning reinforcement has dealt with specific instructional objectives. A very important area of questioning that needs to be pursued is the relationship between internal and external motivation and reinforcement. How can teachers, courses or schools reinforce learning in such a way that a student will develop his own internal motivation and reinforcement? The state of the art does not warrant a large-scale development program in this area, but projects designed to increase and measure the effect of peer reinforcement could have great impact on future classroom organization.

c. Teacher Quality Should be Improved. Variables affected by this assumption include pre-service training and certification, personnel policies, in-service training and incentives.

At the undergraduate level, recruitment and selection of teacher-training candidates have not received a great deal of attention. Academic excellence has not been a prerequisite for these candidates, although many universities now require an academic major for secondary education students. One response to the need for better academically qualified teachers was the Master of Arts in Teaching programs that selected and trained students with strong liberal arts backgrounds. Originally supported by the Ford Foundation, these programs were centered at top universities (e.g., Harvard, Yale, Wesleyan, Stanford) and innovative colleges (Webster). As foundation and Federal funding decreased, and teacher surpluses increased, the programs began to die out. In methods or pedagogical training the current thrust seems to be toward laboratory teaching experiences that provide immediate feedback: the Stanford micro-teaching program and various simulation programs provide the model for much of the work in this area (Mars, 1968).

Although certification requirements are established by the states and consequently vary across the country, the kinds of requirements are similar. One must present a number of hours in education courses, a number of hours in academic courses, and a successful supervised teaching experience. Some states now require a Master's degree for permanent certification; others will accept military or Peace Corps service as a partial substitute for teaching experience.

With the exception of general state-determined certification requirements, personnel policies are usually

established by the local district. The past few years have seen a sincere effort on the part of many personnel directors to recruit teachers who reflect racial and ethnic diversity. In spite of these efforts, the great majority of the newly recruited teachers exhibit far more similarities than differences. For a variety of reasons, primary among which are fiscal constraints, the newly-hired teacher is usually newly graduated from college and has no previous career experience.

Once a teacher has been hired, in-service training provided by the teacher's supervisors is often sparse. In the past, in-service renewal has been the province primarily of institutions other than the local system: university courses, NSF-sponsored summer or academic year institutes, new curriculum project orientations or training programs. The academic caliber of much of this work is very high; however, the dilution phenomenon discussed in the context of course-content improvement still remains a problem. In many fields, the training institutes reach only a small number of people, and even those who participate report that once they return to their classrooms it is difficult to sustain the excitement and rigor of the institute (Kriegbaum and Rawson, 1969).

A very recent development in this country, believed by some to be an answer to the dilution problem, is the teacher center concept (See, for example, Bailey, 1971). Biggs (1969), Featherstone (1971), and others have documented the fact that the British teacher centers have fostered the development of highly relevant curriculum materials whose use is guaranteed by the fact that they are developed by classroom teachers. Furthermore, the development tasks become a natural and successful vehicle for teacher up-grading. University scholars contribute their expertise and successful teachers are given the responsibility of sharing their successes with their colleagues. Similar experiences have been reported by Bentley Glass and other U. S. scientists visiting the Japanese science teaching centers. If the teacher center concept continues to burgeon in this country, such centers combining school system and university inputs may become the locus for improving teacher quality.

The traditional view that subject-matter expertise alone is a sufficient requirement for college-level teaching is strongly ingrained in higher education and is a major barrier to attempts to improve the quality of college teaching. There are other serious barriers,

however, including the imbalance of the reward structure and the absence of agreed-upon criteria and measures. In spite of these barriers, a few programs have been designed that deserve careful attention. The most prominent, by reputation if not in actual enrollment, is probably the Doctor of Arts program, a systematic attempt to relate a student's entire graduate work to a future of teaching (See Eastman, 1970). Unfortunately, the current over-supply of college teachers is a brake on the expansion of this type of program. Various programs internal to departments or schools are designed to improve Teaching Assistant programs or to institute Teaching Internship programs. The Project to Improve College Teaching, supported by the Carnegie Corporation, is concerned with recognition and evaluation of successful teaching (Eble, 1970).

As teacher shortages continue to decline it becomes more important to develop recruitment, training, certification, and selection policies that will insure outstanding teachers. Because there is at least some evidence (Popham, 1971) that teacher certification based on traditional training may not be a positive factor in achieving instructional objectives in the classroom, a reasonable response would be an examination of alternative routes to teacher certification (See Chapter VI). Given the fact that different people exhibit different competencies, a logical next step would be an investigation of appropriate ways to take advantage of these competencies in the classroom.

A very important and still unanswered question concerns the process of keeping outstanding teachers in the classroom. The best training and selection policies and programs are not sufficient if the outstanding people they produce leave the classroom at the end of three years (Andrews, 1968). Perhaps the schools can learn from the universities in this regard where senior staff who are involved in research or administration still may teach courses each term.

d. Schools need more resources. The primary variables affected by this belief are size and money.

In many respects the consolidation of school districts and the creation of consolidated schools within districts are a response to this belief. Larger schools and districts are able to offer more courses and extra-curricular activities to their students and are better able to meet the needs of sub-groups within the student

body by offering accelerated or specialized courses. The consolidation trend is now meeting opposition in many parts of the country from those who believe that schools and districts have become too large and are consequently unresponsive to student needs. Indeed, some research (Barker and Gump, 1964) indicates that student academic performance in consolidated schools may be undercut by psychological outcomes unintended by proponents of consolidation. Gallant and Prothero (1972) have recently analyzed the dysfunction of unlimited growth at the higher education level.

In the sixties, infusion of federal funds to upgrade capital equipment marked another attempt to improve school resources. Language laboratories and instructional materials centers were constructed in schools across the country. Science departments in schools and universities were able to remodel or better equip their laboratories. In the best situations the new equipment was very helpful; in many cases, however, it fell into disrepair or disuse and its value was greatly weakened (See Commission on Educational Technology, 1970).

Serrano-Priest and other recent court decisions have affirmed that, within a given state, resource distribution may be inequitable and, if so, must be corrected. The argument in such cases holds that people *believe* more money buys better education, and therefore lower expenditures are inherently discriminatory. But several studies, most notably the Coleman report (1966) and its reanalysis (1972), indicate that increasing the dollar-level of underfunded districts will not by itself insure educational quality. Yearly expenditure patterns that vary little from district to district in spite of dollar-level funding differences (Kahn and Hughes, 1970) indicate that alternative resource allocation patterns have not been developed. Therefore the most important next step would seem to be an examination of the most effective ways to deploy available resources. This area is discussed at some length in Chapter VI where detailed suggestions for possible initiatives are made.

Subgoal No. 2: Expand Opportunities for Students to Experience Effectual Action.

a. Open Classrooms May Promote Self-Responsibility. The major variables affected by open-education programs are teacher-student relationships, classroom organization, and academic content. In spite of wide variation in operating programs, much of the philosophy behind open

education reflects a belief that students will learn more in a saturated learning environment than in a teacher-dominated one. Changing the teacher's role from leader to facilitator has become the focus of many teacher training or re-training programs. Kohl (1970) and Holt (1970) have written popular books describing ways in which teachers can alter their behavior without the assistance of training programs. The emphasis is on giving students responsibility for their own learning through encouraging independent exploration of topics that interest them rather than requiring all students to learn the same things.

Most open-classroom programs involve a change in classroom organization: desks are rearranged or eliminated, students are encouraged to explore the corridors and other classrooms. The development of ungraded classrooms encourages older students to share the responsibility for the instruction of younger students. Morrison (1972) has recently written of the need to have not only an open but also a full classroom. His concern is that, if students are to learn through personal exploration rather than through external guidance, they must be provided with the widest possible range of materials to explore.

In spite of the rapidly growing popularity of open classrooms, there are serious questions that remain unanswered. An important next step is a careful examination of the open-classroom approach to determine whether this type of education is likely to result in more positive attitudes toward school learning and self-responsibility than "traditional" education. A related question asks whether open education fosters a greater degree of generalizability between classroom and real-world situations than does a more traditional form of education. It is also necessary to find out what conditions are prerequisites to successful installations of this practice. U. S. schools are sufficiently different from those in Britain to make a wholesale transplant inadvisable. Because open education is growing so rapidly in this country, it is not feasible to postpone supportive development action while waiting for answers to the above questions. Necessary work in addition to the above includes the determination and implementation of effective training and support programs for open classroom teachers (See Katz, 1971). A final issue that grows more and more important as open classrooms spread is consideration of accommodation for graduates of such education. Will these students do well in traditional high schools and

colleges? Are there elements of the open-education philosophy that might be incorporated into the higher grades?

b. Independent Study Promotes Self-Responsibility. At the high school and college level, independent or student-guided study is the primary response to the belief that students need to take more responsibility for their learning. Many independent study programs at the high school level give the student responsibility only within a rather narrowly defined domain. A recent report on trends in individualized instruction points out that "individualization does not rule out common learning objectives" (*Education U. S. A.* 1971, p. 3).

In self-directed instruction, the child chooses the materials and determines how to proceed. The teacher and the school administration determine learning objectives and goals In personalized instruction programs, the pupil sets his own learning goals. After these goals are chosen, however, the pupil is required to follow a program established by the teacher and to use specific materials selected by the schools.

A common complaint is that students are unable to structure their time and pursue their intellectual interests without a fair degree of guidance from their teachers. An apparent exception to constraining independence is found in the integrated freshman year program at MIT. Although not all those enrolled thrive in such an atmosphere, those who do find it an exhilarating experience (Educational Research Center, 1970). Other exceptions can be found in those alternative schools and experimental university programs that encourage students to design curricula and teach courses to their fellow students. A recent NSF program (Student-Originated Studies) has also encouraged undergraduates to define on their own and work on environmental problems of concern to them (National Science Foundation, 1971).

An important issue raised in the context of open education is also important here: what childhood and elementary school learning experiences best equip a student for learning independence in high school and college? Is it possible to develop useful, generalizable materials incorporating the best available psychological theory to aid students in learning how to learn?

Subgoal No. 3: Reduce the Isolation of Schools and Students from the Outside World.

a. Available Non-School Resources are not Fully Utilized. Television is probably the best-known, though perhaps not the best utilized, of current non-school resources. Instructional television has had a not too propitious start due to unimaginative programming and fixed time scheduling, though Filep and Schramm (1970) have documented its effectiveness. The Children's Television Workshop productions, "Sesame Street" and "The Electric Company," have broken new ground to become popular examples of educational programming on commercial stations, although they are considerably pre-dated by such programs as "Mr. Wizard" and "Continental Classroom," whose producers estimate that it was watched by over one and one-half million viewers (Stanley, 1971, p. 5). In spite of some negative reaction to "Sesame Street," an Educational Testing Service evaluation (Ball and Bogatz, 1970) reported that it did indeed achieve those goals it set out to achieve. Several local educational stations have now begun producing their own programs for children or adolescents: the quality varies widely with some of the productions good enough to be marketed to other stations. Public Broadcasting Service is now producing pilot films for an adult version of "Sesame Street." Given the total number of possible viewing hours per week, however, the field is still very sparsely populated—there is room for much more work in this area.

Several museums across the country such as the Exploratorium in San Francisco and the Children's Museum in Boston are praised for their educative features. Indeed, many museums have educational divisions or programs that offer short courses to students. One barrier to better use of these offerings seems to be a physical one: it is sometimes difficult to bring the students to the museum program or the museum program to the students.

A program very popular in the mid- and late sixties involved training volunteers to work in the schools. Many were women with college degrees who could spend one or two mornings a week tutoring students or assisting teachers. The training programs varied widely, but school administrators welcomed these volunteers as a way to augment staff without raising costs. Unfortunately the *ad hoc* nature of many of these

programs meant that participation was not always reliable, and many programs were discontinued after one or two years of operation. The opportunity for students to interact with adults other than their teachers is important, and ways to provide that opportunity should be encouraged.

In the late sixties and early seventies, various school districts designed programs to take advantage of non-school educational resources a community had to offer. Probably the best-known of these school-without-walls programs is the Philadelphia Parkway Program (1971). It gave students an opportunity to take "courses" from a wide variety of business and industrial concerns in the city and encouraged students to view the entire city as their school. This program and others like it found it very difficult, however, to sustain an educational structure based on only the good will of the companies and public agencies involved.

It is clear that better ways need to be found to use non-school resources. Cable television offers one way to increase the educational potential of television; the development of high quality programming for this medium should be encouraged. But air-wave television reaches the greatest audience now, and networks need to reevaluate their educational responsibility. Traditional and new concerns in the education business (e.g., textbook publishers, computer firms) may need incentives to create innovative materials. Indeed the more general question is: how can the non-school sector be encouraged to take a greater interest in providing or sponsoring educational services? Possible answers to this question might be developed through an experiment in which an entire town accepted the responsibility of educating its students. All the non-school educational resources would be documented and the school and community would open their doors to one another. A very important component of such an experiment would involve training teachers to use community resources and training people in the community to become teachers. Another, and perhaps not feasible, component would be to persuade profit-making and public concerns that an educative function was a legitimate component of their employees' work day.

b. Work-study Involves the Student in the Community. Work-study programs are viewed as one of the main vehicles for involving students in the economic

life of the community. High school programs in distributive, commercial, and vocational education have placed many students—almost all seniors and juniors—in entry-level jobs for part-time or paired-partnership work. Although the students enrolled in these programs are usually fairly serious and compliant (because over-subscription allows administrators to select only students who will bring credit to the school), a common complaint is that job-assignments are boring and offer no opportunity for advancement. The Satellite Academies in New York City attempt to overcome this complaint by screening jobs very carefully and holding academic classes at the work location so that the teaching staff can provide support services for the working students (Humphrey, 1972). Because college students can find employment with less difficulty than can high school students, work-study programs at the college level are usually less formally organized. Where programs exist, at such places as Antioch and Northeastern, the student may be given assistance in locating a job, but then integrating that job into the student's educational program is not always accomplished.

The USOE Career Education program is an attempt to involve all students in career-related programs (U. S. Office of Education, *Career Education*, 1971), yet there are serious obstacles to its success. One is that it is difficult to provide meaningful work-related experiences that do not involve actual jobs when jobs are scarce. Another is that it is difficult to overcome the unnatural separation that prepares academic students for college and other students for jobs. One potential employer that could use a student work-force is the school system itself. Almost all systems employ students as department, cafeteria, or audio-visual assistants, but the number is small and tasks are often trivial and without educational content. That part of the career education program that is school-based should develop plans for implementing a school-system employment program that could involve students of all ages and ability levels.

c. Continuing Education Reduces Lock-step Approach to Education. Until recently the great majority of Americans believed that the cessation of formal schooling marked the cessation of education. This belief is now being challenged by a burgeoning interest in continuing education as documented by the numbers involved in non-degree or off-site programs. Many view these programs as a means for career preparation or advancement, but others view them solely as a source of intellectual stimulation and enjoyment.

Although there is wide variation in the kinds of programs available, almost all exhibit the common characteristic of not requiring students to participate on a full-time basis. Giving people the opportunity to be part-time students allows them to break down the artificial barriers between school and the real world.

Continuing education as a means to reintegrating school and the non-school world should be encouraged; however, there are problems in this context that need to be ameliorated. In many universities the status of continuing education programs remains low. Students who are enrolled in the same classes and graduate with the same degree as full-time students often cannot qualify for the financial aid the full-time student receives. And there are still some universities that permit no part-time study at all. But because there is high interest in continuing education programs at the college level, this appears a promising area of development, coordinated with creating alternative patterns in higher education designed to create diversity (See Subgoal No. 4).

There is, however, an area in which little work has been done to support the concept of continuing education, that is, within the K-12 school system. The concept of life-long learning needs to be fostered within the school context, perhaps by blurring the lines between school and "real life" with graduation as the demarcation. One approach (suggested by Coleman, 1972) might be to lower the compulsory school attendance age to fourteen and give each student entitlements for the remainder of his high school education. He could decide to follow the standard course and remain in school full time until graduation, or he could become a part-time student, or he could leave school completely and use his entitlements at a later time in his life.

Subgoal No. 4: Develop Educational Diversity.

a. Schools Exhibit Little Reflection of Student Differences. One early response to this assumption was the development of a highly articulated tracking system. Tracking reached its zenith in the mid-sixties when it was possible to find very complicated systems tracking students from A to Q in the same school. Although many schools still track students, a growing interest in open classrooms has reduced much of the structure to a two-track system—college-bound and other.

A more recent response is the attempt to determine exactly what an individual student's needs are. Thus many teachers and schools employ batteries of diagnostic tests at the beginning of the academic year to determine student entry level. Unfortunately, as George Miller (1971) and many other psychologists attest, the current choice of diagnostic measures is woefully inadequate in giving the teacher help in what to do for each of his students. Thus, classroom observers such as Goodlad (1969) point out that once the testing is over the teacher resumes teaching to the average.

Another response to this assumption is the attempt to organize the classroom structure so that each student can work at his own pace. Individually Prescribed Instruction (IPI) developed by Learning Research and Development Center and supported by Research for Better Schools is one of the largest of these programs; by 1971 approximately 80,000 children were learning with IPI programs in 40 states (*Education U. S. A.*, 1971, p. 27). Many of the computer-aided and computer-managed instruction programs also strive to implement self-pacing. Individualized Drill and Practice developed by Patrick Suppes at the Institute for Mathematical Studies in the Social Sciences provides 10-15 minutes of drill in arithmetic at a computer terminal for each student every day; an adaptation of this program is now being implemented in New York City that repeats the drill for each student every evening in his home over the telephone (Jerman, 1971). Most of these programs, however, do not sufficiently differentiate content for individual students; they merely differentiate speed or presentation of the same content.

Actually personalizing content represents yet another attempt to meet the needs of the individual student. Learning contracts (*Education U. S. A.*, 1971, pp. 54-57) and independent study are the common responses at the high school and upper elementary levels; however, they often are rigidly prescribed. At the university level this form of response seems to be more successful. The interdepartmental major has given way to the individualized major and campus exchange programs, at least among some private universities, that give students the opportunity to pursue interests their own schools are unable to meet. Student-originated courses, for example as San Francisco State, and schools with overall themes, such as the University of Wisconsin at Green Bay, also strive to personalize instruction.

One very important unanswered question raised by the concern with individualization is: how can assessment of individual differences be improved and used in planning and evaluating individualized or personalized programs? Another major issue which has not been adequately explored is the accommodation within the school or university of personalized programs. This issue includes a consideration of the extent to which a common core or foundation of learning is desirable for all students.

b. Lock-step Approach to Learning. The belief that schools should not impose a rigid time or organizational structure on student learning has led to some experiments with scheduling or staffing. Modular scheduling reflects the belief that providing a fixed length of time (usually 45-60 minutes) every day of the week for every subject at the high school level may not be the best way to encourage intellectual diversity. The day is divided into small modules (10-20) minutes that are combined in different patterns for different days. This scheduling, in which courses may meet two or three days a week instead of five, gives the student sizable amounts of unassigned time within the school day. In some schools, this time is completely free; students are required to be in school only when they have classes. In others, they must remain on the school grounds and some they must report to learning centers. Modular scheduling is found most often in suburban systems that are not worried by problems of control. Generally, it has been evaluated more positively for older high school students than for younger ones. At the elementary level, open classrooms, discussed above in the context of giving students more opportunities to experience effective action and develop self-responsibility, also respond to the belief that a rigidly structured day impedes the development of educational diversity. In some open classroom settings, students are allowed to develop their own daily schedules.

Another development at the high school level to lessen the highly structured nature of the school year is the mini-course. Many schools, even those with a traditional five-to eight-period day, are now offering nine-week courses instead of year-long or semester courses. In social science and languages, these courses tend to replace year-long surveys with a wide variety of sub-topics covered in greater detail. Usually students are allowed to choose their own mini-courses from a sizable list of topics; the shortened time span and the elements

of diversity and choice on the part of both the student and the teacher are viewed as positive inputs to the learning structure.

A growing number of teachers and students are reacting to existing organizational and structural patterns by creating alternative schools within the system. These schools rarely have over 150-200 students and function as autonomously as possible. Although they may occasionally receive a part of their funding from private foundations or special grants, they are still considered a part of the school system and may even be attached, for administrative purposes, to one of the traditional schools. Their styles and philosophies may differ radically from one another, but almost all of these schools embody the belief that conformity to the traditional model of education is unsatisfactory.

At the higher education level, MIT has experimented with concentrated study courses (King and Parlett, 1969), designed to give the student an entire sixteen-week course in four weeks of full-time study. Although student evaluation was favorable (King and Parlett, 1969, pp. 8-20), it is a difficult option to schedule as a part of the traditional academic year because a single course does require a full-time commitment. Many recommendations are now being made for alternative structures, among the most prominent being those made by the Carnegie Commission (1971) and the Newman panel (1971). A number of institutions are attempting to reduce conformity to traditional models through a variety of programs: the Open University of Great Britain (Walsh, 1971) and the University Without Walls sponsored by the Union for Experimenting Colleges and Universities (1972) embody the most sweeping of these alterations; non-residential degree programs are being developed by Empire State College (1971) and the New York Board of Regents (Valentine, 1972).

The belief that education need not be tied to a single time or place, which is beginning to grow through the open university concept, also has great implications for expanding educational diversity (and indeed for decreasing educational isolation). As development work on that concept continues, it will be important to look for elements that might be transferrable to more traditional universities and to secondary schools. Good programs of non-traditional study should be supported at all levels of education in order to test the assumption that their growth will help the educational system better meet the diverse needs of all its clients.

Subgoal No. 5: Encourage Individual, Community and National Examination of the Goals of Education.

a. School Systems are Unresponsive to Their Constituencies. Particularly in larger cities, many people believe that school systems have grown away from their constituencies. Some systems attempt to modify this belief through the creation of parent advisory councils or school-community councils at the individual school level. Although these organizations may become useful in increasing communication between school and parent, they often encounter a lack of responsiveness at the district level that then frustrates both the parent and the school. In another attempt to give parents more information, a few systems have employed a hot-line to answer parents' questions at any time.

To the charge that student interests are not always well represented by the schools, systems have responded by employing outreach workers or youth workers whose prime role is to represent the student's point of view. At the university level, students are beginning to find representation on major committees and, at some institutions, on the board of trustees. In a very few communities, high school students are even running for election to the school board.

In the largest school system in the country, decentralization was proposed as the answer to unresponsiveness. Results have been equivocal. There are those who believe that one large unresponsive system has been replaced by several smaller unresponsive systems. Edmund Gordon points out that decentralization "is only a structural approach to reform." He continues,

as such, it may guarantee that at least for a *while* the bureaucracies will be smaller, more susceptible to change, and probably more responsive to the communities served. But in and of itself, decentralization does not guarantee high quality or even improved education (1968-69, p. 2).

But the concept deserves further attention.

The most extreme reaction to a belief in the system's unresponsiveness comes from those parents and students who feel that no amount of information exchange, community representation, or decrease in size will ever make the system responsive to their beliefs

about education. Thus, they leave the system completely, and with friends who share their beliefs, establish free schools or universities, community schools, or alternative schools outside the present system; these alternatives now number close to five hundred.

It is necessary to determine the impact of these extra-system schools on the system itself. Do they aggravate the problems of the overall system by draining off the most concerned parents and the most creative teachers and students from the "regular" schools? Or do they act as a pressure valve for removing those constituents who are most dissatisfied? Perhaps they can be viewed as one source of the educational diversity discussed above. But they do not respond to those parents whose children are still inside the system and who find it difficult to make that system understand their problems and desires. For that, it may be necessary to define new channels of communication and responsibility. A possible next step might involve investigating different levels of autonomy: one plan would make principals rather than district-level administrators autonomous; another might give individual teachers autonomy. Concentrating autonomy in easily identifiable individuals might greatly increase their responsiveness to their constituents.

b. Different Groups Disagree Over Educational Priorities and Processes. Although few parents and educators would quarrel over the general goals of education discussed in Chapter II, there is often serious disagreement over the means to achieve these goals. This disagreement occurs not only among parents, students and educators; it also exists within each of these groups. The only common responses to these disagreements are discussed above in the context of reaction to the unresponsive system. Within the format of community or parent councils, discussion usually focuses on specific school operating procedures as ends in themselves rather than as means to more general educational goals, thereby obscuring more fundamental issues. There is a basic need for both a forum and a vocabulary for coming to an understanding about what the goals of any educational institution and the means to those goals are and ought to be. This need can probably only be met through expanding and refining the information base available both to educators and to the general public. Much has been written about the inadequacy of traditional dissemination techniques in education (for example, Gideonse, 1969; Rittenhouse, 1970; and Havelock, 1971), but improvement in this

field has been slow. In order to promote communication among groups, however, it is necessary that work in dissemination reflect a consideration of the needs of both professionals in education and the public at large.

D. Research and Development Initiatives

The foregoing analysis indicates a number of areas in which further work is needed to meet the sub-goals for improving the quality of education. *Rigorous intellectual challenge* is possible only through the development of approaches that promote genuine engagement with the substance of instruction and that teach complex skills and the use of knowledge as a tool, the provision of appropriate purveyors of those approaches such as educational technology and a range of different types of teachers, and the dissemination of those approaches. *Providing opportunities for effectual action* inside and outside the classroom requires the development of programs that give the student academic, social, and career learning responsibilities, programs that are also necessary for intellectual challenge, and *reintegrating schooling and real life*. This integration must proceed simultaneously in two directions: moving the student into the community and moving the community into the school. *Fostering educational diversity* should involve supporting good examples of non-traditional study and designing alternatives to present instructional and institutional patterns that will meet the needs of poorly served client groups. *Encouraging articulation of the goals and processes of education* requires an assessment of current practice and thorough dissemination of that assessment. The following suggested NIE program initiatives reflect these areas in which further work is necessary and thus have impact on the sub-goals for improving the quality of education. Each initiative comprises programs that speak to one sub-goal but may also be relevant to others; although each initiative may be implemented independently, they enhance one another and so should not be viewed discretely.

1. Complex Skills

a. Basic Idea. Observers of social change in this country point out that the rate of change is increasing dramatically; the "knowledge explosion" is a prime indicator in their description of technological or post-technological society. Whether or not one believes their predictions for the future of society, it does seem necessary to re-examine the skills with which schools

equip students to face that future. For most individuals, reading is important but certainly not the only or even the primary way of processing information. Writing also is only one of many tools for composition or information display. And arithmetic is being supplemented, and in some cases supplanted, by cash registers, adding machines, tax accountants, and computers. This program calls for the examination and development of approaches to the acquisition of complex skills and the installation of successful approaches in a variety of instructional settings.

b. Examples. Such complex skills include: heuristic problem solving—presently being developed in LOGO projects at MIT, Syracuse, Bolt Beranek and Newman, and other sites; information processing and evaluating skills; information display or composition (suggested by Alan Purves in the Report of Curriculum Developers [See Robinson, 1972]) including writing, film, collage, dance, etc; learning how to learn.

c. Program Description. The development of imaginative new instructional components requires the involvement of high caliber people from a variety of disciplines. Participants should include: individuals from universities, industry, and appropriate teaching levels who are experienced in development work; computer scientists and media experts; Drucker or other analysts who have defined skills necessary for the future; psychologists; artists; experts in installing new curricula and teaching methods in schools.

These persons should be asked to consider the kinds of complex skills that need to be taught and suggest various formats for presentation. (For example, it is not at all clear that a year-long or semester "course" housed in a single department would be the most effective way to proceed.) Problems and issues need to be defined that promise to be particularly promising foci for advancing higher cognitive learning. Development work, which must be characterized by both intellectual rigor and ease of implementation, is likely to take place over several years in the context of a variety of projects spanning interdisciplinary subject matter and concentrating on upper elementary and secondary levels. Testing and installation in educational settings could involve Regional Laboratories with appropriate experience.

d. Actions. In the NIE planning phase, the first step should be a talent search culminating in meetings of people who could contribute to plans for

work on complex skills. The participants should include people from other agencies (NSF, Arts and Humanities Foundations) who have had past experience in development work. Suggestions and proposed plans resulting from such meetings should be reviewed and criticized by both practitioners and scholars, and amplified suggestions should be solicited.

In the NIE operational phase, proposals would be invited for development of approaches outlined in the planning phase. Proposals would be judged on likely quality and applicability of product, caliber and variety of people involved, breadth of target audience, and implementation plans. The start-up phase budget during fiscal 1973 would be under \$500,000, but the program budget would need to expand to \$3-5 million within two or three years, depending on the number of developments to be supported.

2. Purveyors of Instruction

a. Basic Idea. A growing body of literature suggests that a single, conventionally-trained classroom teacher may not be the most effective or efficient way to purvey instruction in all situations. This program attempts to demonstrate the feasibility of alternative purveyors of instruction, specifically multi-leveled staffs and educational technology.

b. Examples. Presently feasible educational technology includes: computer-assisted and computer-managed instruction, film, video tape, audio cassettes, closed-circuit educational television. Feasible in the near future will be interactive cable television. Several systems have experimented with differentiated staffing, but these experiments have been interested primarily in redeploying conventionally trained and certified teachers, sometimes with the assistance of paraprofessionals.

c. Program Description. A number of planning efforts are now going on to identify opportune targets for use of technology in education. These include work by a Technology Panel (Truxal, 1971) convened by the NIE planning unit, by the Education Panel of PSAC, by the National Academy of Engineers for USOE, and by the Educational Panel of FCST's Automation Committee. The last is concerned with enhancing productivity, a theme taken up in Chapter VI. NIE'S role will be to explore targets thus identified and develop the most promising to the implementation stage.

(For a detailed rationale and description of current efforts in using educational technology to enhance quality, see Appendix B.) For each target, the following steps will form components of an overall program:

- 1) Conduct studies of the use of communications technology in education in order to identify the crucial factors leading to successful applications in specific instances and inhibiting broader use. Each application needs to be examined along several dimensions: educational effectiveness, both cognitive and affective; costs, for start-up and for continuing operations; suitability for specific settings: age levels, subject matter, physical environment, and human support components; anticipated contribution to quality.

- 2) On the basis of such studies identify the most promising approaches for specific audiences and specific instructional purposes, using a particular medium in a well-defined systems setting.

- 3) Develop identified approaches through limited experimentation, test out the assumptions made, and fill in information gaps.

- 4) A second-state effort in which the most promising of the developments studied and tested out in 3 (above) are piloted in several (five to ten) sites.

- 5) Wide-spread introduction of proven technologies in appropriate settings. This phase will be beyond the concerns of NIE, except for advisory and seed money to assure successful installation.

The following steps comprise the overall multi-level staffing program.

- 1) Support interdisciplinary studies of the variety of roles teachers perform in the classroom. (This might initially be limited to elementary school.) The studies should include at least anthropological, sociological, and psychological perspectives.

- 2) On the basis of these studies, determine the kinds of people, trained and untrained, who could best fill those roles and estimate from the amount of time the observed

teachers spent in each role what proportion of the total staff should be made up of each kind of person.

- 3) Determine feasibility of actually staffing a school using such a pattern. Criteria would include reasonable cost, availability of the kinds of people determined to be necessary, receptiveness within a community about to staff a new school, etc.

- 4) If feasibility criteria are met, implement the plan with appropriate support and evaluation. Even if feasibility criteria are not readily met, the documentation resulting from the studies in 1 (above) should prove to be very useful in school administrative planning and teacher training programs.

d. Actions. In the NIE planning phase for the technology component of this program, NIE will be able to take advantage of the planning efforts noted above, which are likely to include specific suggestions for work by such agencies as NSF and NIE. For multi-level staffing, planning will include preliminary work on who can perform studies as outlined in step 1 and what sites might be receptive to such investigation and later experimentation with staff diversification. The Oregon Center for the Advanced Study of Educational Administration and the Stanford Center for R&D in Teaching may be a focus for some of the planning phase.

In the NIE operational phase, since both the technology and multi-level staffing programs require several steps, operations will vary according to the phase a specific project is in. For optimal operation, several projects should be carried on simultaneously, not all in the same phase, so that study can feed into development and results of testing and pilot implementation into further study. Operational details will depend on the specific nature of each project, but sufficient NIE leadership and monitoring must be exercised to assure successful execution through the pilot and evaluation phase of each major project. Projects must be coordinated so that a suitably wide range of media and staffing problems are fully explored.

Costs for this program could be sizable, although individual major projects will need careful planning, so that the start-up phases in fiscal 1973 and 1974 may be budgeted at \$2-3 million. As several projects become

operational, however, the budget for this program may run as high as \$25 million, allowing for 5 major projects and several in exploratory stages.

3. Early Exit Experiment

a. Basic Idea. This program, suggested in general form by Coleman (1972), has as its purpose reducing the separation between high school and the real world. It involves lowering compulsory school attendance age to fourteen and giving students entitlements at the end of ninth grade, usable at any time, for the remainder of their high school education. These entitlements could be used in either school or non-school settings.

b. Examples. A common example of entitlement for further study is the GI Bill, giving educational benefits to veterans. At the high school level there is no formal program in operation, although it is common practice for schools to re-accept students who have previously dropped out for a variety of reasons and for states to certify high school graduation through equivalency examinations.

c. Program Description. The preliminary work for this program must be done by interdisciplinary teams capable of assessing the multitudinous consequences of such a program. One team, composed of a variety of social scientists and education practitioners, will design the basic structure (or alternative structures) of such a program, including eligibility criteria, fiscal support mechanisms, certification, etc. Another team or group of teams will design means of providing educational experiences outside the schools for those who choose to use their entitlements in that way. (Some of the work now underway for the employer-based model of Career Education will undoubtedly be useful in this context.) These designs will then be circulated widely to solicit reactions from the school and university communities and from bodies representing a broad spectrum of interests, such as PTA's, unions, trade and professional organizations.

As a result of these designs, a variety of activities will be implemented on a short-term basis to determine their efficacy. One activity might test the feasibility of allowing students to find their own jobs or develop their own learning experiences. Under carefully controlled conditions, this experiment could yield useful results about the kinds of services it would be necessary for

agencies to provide. Another activity might develop modified trade and industrial apprenticeships, possibly in conjunction with the educational branches of various unions. A third activity might entail the expansion or modification of existing night-school courses for those students who chose to work during the day, but who wanted to use their entitlements for a traditional educational program.

Implementation of all the field-tested activities in a small number of school systems will comprise the initial test of the total design. Interdisciplinary evaluation will attempt to document such questions as:

What kinds of students choose this program?

Of those who do, what kinds avail themselves of the alternatives provided? What kinds use their entitlements on non-school activities they developed themselves?

What are the economic, social, and academic consequences for each student?

Of those who choose early-exit and do not participate in any sanctioned activities, how many return to school (or begin to use their entitlements in some other way) within five years?

What kinds of educational programs need to be provided at what sites to give adequate access to needed education?

d. Actions. In the NIE planning phase, select and convene planning teams to develop alternatives for the total design and for the various activities offered as choices within each design. These teams will probably require a series of meetings with individuals working separately between meetings. The product at the end of these meetings will be a series of planning documents delineating: feasible fiscal arrangements; development needed to provide alternatives in training and educational opportunities in school, home, or on the job; necessary field work to obtain cooperation of all involved private and public agencies; nature and design of evaluation.

In the NIE operational phase, since this program involves a radical departure from current practice, careful testing in appropriate sites must be the first operational stage. This will entail several steps:

1) Location of five to ten test sites, preferably representing different types of school systems and student populations.

2) Careful preparation in terms of attitudes of and coordination with local and state education agencies, parents and students, local businesses and unions, community agencies and representatives, and neighboring institutions of higher education.

3) Simultaneously making arrangements for alternative educational sites and sponsoring development of new instructional materials when necessary.

4) Implementation in the identified test sites.

Steps 2-4 could be carried out by the selected school systems themselves, but substantial involvement by NIF and its consultants in each of these steps is more likely to result in effective testing out of the feasibility of various alternatives and the whole program itself. The next step must be carried out by independent evaluators along specified dimensions:

5) Assessment of the experiments in order to document what happens to students choosing to exercise an entitlement option.

Since this program requires careful planning, initial costs will be confined to this phase and be on the order of \$100,000 in fiscal 1973. Presuming that sites are chosen by the end of that year, costs in fiscal 1974 may run to \$500,000/site (entitlement funds coming largely from local and state education agencies) plus \$2 million for needed instructional development applicable to several sites.

4. Unbundling of Higher Education

a. Basic Idea. Many students who are interested in the benefits of higher education are unable or unwilling to pursue them in a traditional full-time four-year package of study. Alternatives to the traditional model have, in the past, consisted of offering students the same components as the traditional model (lectures, courses, credit hours, majors, final examinations), but in an elongated or shortened form

(e.g., extension courses and part-time enrollment, advanced placement credit), so that students are able to vary the amount of time necessary to complete a degree. The university, however, still provides all the components and the certification.

This program explores the feasibility of separating into discrete components—carried out by both the profit and non-profit sectors—a variety of the services offered and functions served by institutions of higher education, with the end goal of creating alternatives that will introduce greater flexibility and responsiveness to individual students into the system of higher education. A more detailed discussion of this proposal can be found in Appendix C. The program is also designed to respond to the suggestions of the Newman Panel Report (1971) and the Carnegie Commission Report, *Less Time, More Options* (1971).

b. Examples. Examples of the functions and services of higher education currently being explored outside traditional institutions include:

Instruction—portions of this component are under development in the current knowledge industry.

Credentialing—current prototypes include testing agencies such as ETS and professional licensing bodies such as the various state bar examining agencies.

Counseling—present work is best developed at the pre-college level in college placement agencies and handbooks.

c. Program Description. The development of this program will require the counsel of a wide variety of people with expertise in the functions and services of higher education. They would be asked to refine further the kinds of activities suggested here and determine development criteria. Development activities would include extension of external credentialing agencies, such as the ETS College Level Examination Program; the New York State Regents External Degree Program; the University-Without-Walls performance-referenced assessment now under development; and accreditation of professional competence by professional societies.

Other activities would include development of

institutional components, such as courses developed by professional societies to meet the requirements of their proficiency examinations; extension of the University-of-the-Air and the TV College prototype to cable television; cooperative efforts between institutions of higher education and industrial concerns to design portable specialized courses; and an inventory of existing resources in specific geographic areas.

Studies are needed to determine the optimal financial support measures for students wishing to take advantage of a variety of educational and instructional components, once they exist, such as credit banks for four years of higher education and full funding of higher education.

Evaluation of the program would include examination of costs, career achievement, academic attainment, social and psychological effects on individual and family, and effects on existing institutions of higher education.

d. Actions. In the NIE planning phase, a number of different types of agencies, institutions, and individuals will be contacted to solicit plans in their own areas for carrying out some of the components of the program. Information will also be gathered on student interest and institutional (i.e., administrative and professional staff) attitudes concerning the proposed "unbundling." Included will be:

Exploration with testing and professional agencies on possibilities of developing much broader ranges of testing and evaluation measures, first to be used for credit by colleges and universities, later to serve as tools for expanding the base of available mechanisms.

Planning for discrete components of instruction, in close coordination with projects being developed under the technology component of Program 2.

Fleshing out by experts in higher education finance of alternative support mechanisms for students.

Design by broadly conceived interdisciplinary panels of the types of evaluation that will be needed in order to assess the effects of de-institutionalizing higher education.

In the NIE operational phase, necessary components will be built over a number of years, starting with the extension of credentialing mechanisms and development of discrete instructional components. At the same time, student interest will be solicited and cooperation of colleges and universities enlisted through active involvement in the execution of specific functions, such as serving as central information and counseling centers. The complete range of services allowing a student the non-institutional route for all four years of college is not likely to be available for several years, therefore few assessment activities other than planning will be started in fiscal 1973 or 1974. Extension of credentialing and provision of discrete instructional components can begin within a few months of the inception of the program and are also likely to be costly; budgets for fiscal 1973 and 1974 should allocate \$3 and \$6 million, respectively, to this program.

5. Understanding and Supporting Emerging Innovations—Open Education

a. Basic Idea. All too often, emerging educational innovations become fads before they are well understood. The resulting hurried, and sometimes even careless, wide-spread adoption results in at least two negative effects: first, actual implementation often is not based on sound theory or conceptualization; second, evaluation of the implementation is neglected and consequently there is little helpful input for redesign or reconsideration of the innovation. On the other hand, promising approaches will and should be tried out even in the absence of full understanding of all the relevant variables, but such experimentation should be carefully observed in order to develop better understanding.

Therefore, this program suggests the careful support of important emerging innovations, support that includes developing an understanding of what makes them work and how they can be replicated. Currently there are at least three educational innovations of rapidly growing importance: open classrooms, alternative schools, and development of increased accountability (including performance-based criteria for assessment and performance contracting). A full program of investigation might include all three; for purposes of this analysis, however, a discussion of the investigation of one—open education—will serve to indicate methods that would be generally useful for other innovations (See Katz, 1971). The method involves:

Establishing criteria for success.

Closely monitoring successful examples to answer the question: How does this work?

Whenever possible, articulating theory behind the innovation or answering the question: Why does this work?

Determining support strategies necessary for successful replication of the innovation.

b. Examples. The kinds of questions to be answered in an examination of successful examples of open education might include:

What teacher attitudes and behaviors characterize successful open education teachers?

What selection and training procedures are useful for open education teachers?

What administrative patterns are helpful in open education?

What parent and community attitudes are necessary?

What kinds of experiences do children have in successful open classrooms?

In what ways are educational goals met more successfully through open education, i.e., how are the children who have gone through it different?

c. Program Description. A panel of recognized leaders in the field of open education will be asked to define criteria of success, identify examples of high-quality open education programs, and determine the most important issues to be assessed. Some new experiments with specific target populations should also be supported in order to examine parameters not present in existing and spontaneously arising programs. A judicious variety of assessment techniques will then be employed in all the sites included to document the operation of open classroom education and such support activities as teacher training and curriculum development. Assessment techniques should probably include case studies of individual children;

anthropological observation of the classroom "culture;" psychological observation of teacher attitudes and beliefs; and sociological analysis of parent and community support.

The assessment ought to produce a succinct statement of elements necessary for successful open education. These elements should then be applied in an engineering approach to replication in selected sites that wish to implement open education. Positive results in replication should be made available to everyone with an interest in open education.

d. Actions. The NIE planning phase includes selecting and convening the panel of recognized leaders in the field of open education; contacting nominated examples of high-quality open education programs and identifying those willing to cooperate in the study and assessment activities; developing a detailed plan of assessment and evaluation methodology recommended by the panel; and designing specific experiments to test out this approach with populations and in types of schools not already part of ongoing implementation.

In the NIE operational phase, assessments will be carried out on existing examples of open education and proposals solicited for new experiments of specified parameters. As information is accumulated, it will be synthesized—conceivably in the context of in-house NIE research—to feed into further implementation of open education through a second round of proposals for replication of the high-quality programs. The assessment results should also be made available to scholars involved in theoretical conceptualization of open education. Costs of the program during fiscal 1973 are estimated at \$1 million and likely to rise to \$3-5 million, depending on the number of sites to be assessed and new experiments to be initiated.

6. Expanding the Usable Knowledge Base

a. Basic Idea. This program grows out of the assumption that building better educational theory, encouraging articulation of goals, and taking advantage of the best practice is essential to improving the quality of education but that this can only be achieved through expanding the knowledge base available to educators, policy makers, and the general public. It suggests that a careful examination of a variety of current practices can

aid greatly in improving the quality of education. Such examination would have at least two foci: basic studies in naturalistic settings in order to increase theoretical understanding of schooling variables, and spreading awareness about successful educational approaches to encourage their replication in suitable settings.

b. Examples. The varieties of current practice and research that should be examined and extended include:

Outstanding successes, including teachers, administrators, and innovative organizations.

Cross-sectional and longitudinal sampling of current practice—the Coleman survey provides a model for the former; Project Talent is an example of the latter.

Retrospective studies of “successful” and “unsuccessful” individuals with respect to their schooling history, particularly where there seem to be some commonalities, e.g., the graduates of the 40’s and 50’s from Dunbar High School in Washington, D.C.

Promising, but not widely known, departures from usual practice—this step might be a precursor to the more extensive study of emerging innovations suggested in Program 5.

Historic events—these might include teacher strikes, school bond defeats, opening of a new school, following the evolution of schools or institutions of higher education as their clienteles change through altered housing patterns, integration, or open admissions.

Cross-cultural studies—perhaps a study of varying attendance patterns and their effect on achievement, the occurrence and treatment of “reading problems,” of the relation of parent and community expectation to achievement in other cultures.

c. Program description. A variety of projects will be supported ranging from unsolicited basic research to contracted studies examining an area of practice, a series of events, a subpopulation, or a set of crosscultural variables specified by NIE. The

methodologies to govern the conduct of particular studies and assessment of practices will vary with the area being examined. Dissemination will also vary depending on the relevance of findings to researchers, educators, policy makers, or the general public. Many of the studies, their synthesis into usable knowledge, and their dissemination to appropriate audiences will affect social scientists, operations research specialists and systems analysts, evaluators, computer scientists, classroom teachers and other education practitioners, and journalists.

Preliminary designs for examining several of the proposed areas will be tested in a small number of situations to determine what kind of information will prove useful to the several groups to be served. Larger scale efforts will incorporate appropriate modifications in order to address the program’s twin objectives of developing a better theoretical understanding and spreading improved practice. The dissemination work may well be performed by a collection of agencies, including universities, Regional Laboratories, film studios, and free lance journalists. In addition to research literature for social scientists, possible products might include a consumer’s guide to educational products and services for educators and a series of television documentaries on current practice for the public.

d. Actions. The NIE planning phase will include the following:

Soliciting recommendations for promising study areas from a wide variety of sources;

Developing guidelines for unsolicited research within defined areas, e.g., retrospective studies on “successful” minority members; comparative examination of schooling variables in Western countries and their effects on academic achievement;

Identifying events or practices to be examined through contracted studies, e.g., an appraisal of within-system alternatives such as the Murray Road School (Newton, Massachusetts) or the Woodlawn Program (Arlington, Virginia);

Initiating negotiations with contractors to perform targeted studies.

In the NIE operational phase, activities include the following:

Establishing evaluation criteria and mechanisms for the unsolicited research component;

Supporting several targeted studies on a small scale to develop appropriate assessment methodologies;

Modifying the program in accord with the experience obtained through the two steps above;

Designing and contracting for suitable dissemination.

Costs of this program could be modest in fiscal 1973, about \$800,000. Growth in the following years will depend entirely on availability of funds. This will also determine the number and extensiveness of studies to be supported. Prototypes for the suggested activities exist within the NCERD complex of projects slated for transfer to NIE; the suggested NIE activities under this program will, however, be a focused and integrated set of projects designed to provide a cumulative and synthesized fund of knowledge.

The six programs described above are only a portion of a complete R&D agenda to improve the quality of education. They were selected for description to indicate the scope of work necessary. Below is the outline of a more complete agenda with indications of where the above programs are placed in the total design.

1. Programs in Intellectual Substance

Complex skills (Program 1).

Purveyors of instruction (Program 2).

Assessment of additional work necessary in curriculum development focused on interdisciplinary and new organizations of substance—a small-scale program conducted in conjunction with other government agencies such as NSF and the Arts and Humanities Foundations to determine gaps in K-12 high-quality curricula.

Dissemination of quality work—this might include the support of demonstration “teacher supermarkets” or the production of a consumer’s report for teachers.

2. Programs in Re-Integrating Schooling and Real Life

Early exit experiment (Program 3).

Career education—the employer-based model of Career Education should be extended to provide additional opportunities for students in grades 10-14, community sites (libraries, recreation centers) should be developed as alternative foci for career education.

Social institutions curriculum—the development of this curriculum would give all high school students the opportunity to learn about those social institutions which impinge upon all citizens—the tax structure, the legal system, banking and credit, etc.—at a practical level. One institution that might be useful for study by older students, perhaps at the college level, is the educational institution of which they are a part.

Life-long learning—this program should include experiments to encourage the non-school sector to become more interested in providing or sponsoring educational services. For example, in some concerns, usually in the scientific sector, there is a conscious effort to involve all professional employees in teaching and/or learning. These efforts should be examined and their growth should be fostered. Internships in a variety of public and government agencies and in the private sector might be sponsored.

3. Programs in Fostering Educational Diversity

The unbundling of higher education (Program 4).

Support of emerging innovations (Program 5).

Experimental schools—a program designed to recognize and support good practice and to foster alternative educational structures.

Improved assessment of individual differences and understanding of the instructional techniques appropriate to different learning styles.

4. Programs to Encourage Articulation of the Goals and Processes of Education

Expanding the usable knowledge base (Program 6).

The multiperspective analysis of educational objectives and evaluation (Program 1) suggested in Chapter VI, while focusing on resource use in education, is also an integral component of better goal definition and articulation of the educational process.

V. IMPROVING EDUCATION FOR THE DISADVANTAGED

A. Problems

Evidence has been cited in the two preceding chapters which shows that the educational system is neither fulfilling current goals nor exercising leadership in formulating more appropriate goals. The lack of rigorous intellectual challenge, isolation, and scarcity of opportunity for effectual action are detrimental to all students—but their effects are even more exacerbating for poor and minority students whose special situation in society does not provide the ameliorating circumstances that can make the educational experience, for all its inadequacy, at least not disabling.

So-called “disadvantaged students” negotiate the system with less expertise than do more privileged students, as evidenced by the large numbers of underprivileged students that are cutting school, failing, and dropping out. A study of what is currently known leads to defining the following four major causes for such failures: the mystique of the “disadvantaged student;” the stance toward and treatment of low-income populations by schooling and other societal institutions; education’s failure to understand home, community, and peer interactions; education’s inadequate response to the increasingly prevalent awareness of the shortcomings of schools and society.

These causes reside in the major determinants of educational output discussed in Chapter II; each will be analyzed in greater detail below.

1. The Mystique of the Disadvantaged Student

Although the tendency in educational circles has been to look to the child rather than to the system as the source of the problem, educators do not agree on the causes of school failure among poor children. Theories

concerning learner characteristics include cognitive, affective, and physiological deficiencies, and relationships with school, adults, and peers.

a. Cognitive Deficiencies. Some authorities maintain that the child is cognitively deficient (Englemann and Becker, University of Oregon). Jensen (1969) contends that this deficiency is innate. Most schools consider the disadvantaged child as “different” but there is wide disagreement about what the differences are and what they imply with respect to educational practice. It is true that when measured with commonly-used instruments the cognitive development of disadvantaged children tends to be different from and frequently is slower than that of middle class children. In many instances this observed difference has led to a belief that the poor youngster cannot learn as much or as rapidly as other youngsters. There is, however, recent impressive evidence (Ginsburg, 1972) that competent teaching of poor children will result in their learning difficult concepts and skills as rapidly and as well as other children learn them.

b. Affective Differences. As with cognitive attributes, differences appear to exist between advantaged and disadvantaged youths in affective attributes. For example, some researchers (Zigler, 1970) have found the middle class child more ready to experience guilt and to turn his hostility inward. But research results are not consistent. The affective characteristics of disadvantaged children and youths are probably related more closely to their specific subculture than to their overall socioeconomic status. Here again, the best practice is ahead of theory. The teaching experiences of Kozol (1967), Herndon (1965), Dennison (1969), Ashton-Warner (1963), Kohl (1967), and others have raised questions about the notion that poor children are unmotivated, undirected, unable to

delay gratification, uncommunicative, and uncontrollable when removed from rigidly structured settings. Their work does suggest, however, that a poor child's self-confidence and feelings of control are not enhanced in typical schools and classrooms.

c. Physiological Deficiencies. In the area of physiological deficiencies and early development, there is general agreement that children of poor and minority families begin life with greater health problems induced by prematurity, poor nutrition, and other conditions associated with poverty (Birch and Gussow, 1970). Such problems are worsened by inadequate health resources. Though this area needs and is receiving further study, the research so far indicates a learning-related need for greatly improving pre- and post-natal care of poor infants and for providing better health and nutritional services for young children. Perhaps no statement has been quoted more frequently in compensatory education circles than Bloom's (1970) suggestion that 80 per cent of a child's intellectual development occurs by the time he is eight years of age. Whether or not this interpretation is accurate, most studies do indicate the importance of the child's early growth and development for his later achievement.

d. Relationship with Schooling Institution. Considerable evidence (Gordon, 1970) exists to suggest that identification with the school is associated with higher achievement. Since disadvantaged populations are less likely to identify with such social institutions as schools, this could be an important factor in achievement. Once again, there is a small but impressive body of evidence which argues that underprivileged students learn more when the institutional atmosphere is supportive and accepting (Silberman, 1970; St. John, 1971).

e. Relationship with Adults and Peers. That the child's relationship with adults and peers is an important aspect of his development is indicated by such studies as St. John's (1971), which demonstrate the greater achievement occurring among some ethnic sub-groups with a nurturant teacher; anthropological and psychological research on cooperation and competition (Romney and Romney, 1963; Kagan and Madsen, 1971; Madsen and Shapiro, 1970); and various studies of child rearing practices by Maccoby and Gibbs (1954) and others. In providing educational opportunities for minority populations, schools have not been able to avoid ethnocentricity or to recognize the validity of

socialization procedures which differ from middle-class practices. The work of Bettelheim (1969) and Bronfenbrenner (1970), describing the cultural viability of socialization procedures that rely extensively on peer groups, provides insights which—if internalized by educators—might result in beneficial changes in school behavior.

2. The Stance Toward and Treatment of Poor Minority Populations by Schooling and Other Societal Institutions

Poor and minority communities have often been studied in an isolated context, but until low-income persons are seen as a part of the majority society receiving fewer benefits than other persons and being forced to adapt somehow to discrimination, prejudice, and lack of opportunity, understanding which leads to genuine reform and amelioration will be incomplete. While Banfield (1968) is probably correct in saying that America's poor people are richer than poor people anywhere else in the world, relative deprivation may be no less disabling to the richest poor who live among the richest rich of the world than it is to persons in more desperate situations.

The poor person is likely to believe that dominant institutions work to his disadvantage, but he usually lacks, as do most other Americans, a precise understanding of how such institutions work. Laura Nader (1970) argues the critical need for an understanding of institutional behavior as it affects everyone, not least the poor. Much of the consumer's helplessness with respect to education and other services, she maintains, derives from pervasive failure to understand how the institutions of society function. Since the effects of discrimination and deprivation are long-term and widespread, and since survival in a hostile environment mandates responses which may become maladaptive in seeking access to the socioeconomic system of opportunities and rewards, genuine progress toward removing stubborn barriers can occur only through reforms reflecting an understanding of the impact of social and economic institutions on the poor and minority groups.

For example, both inner-city and rural populations are extremely vulnerable to economic and political vicissitudes. Work is short-term, sporadic, or poorly paid; a major illness is usually a catastrophe; the policies governing those institutions on which these groups must

rely are shaped in distant quarters and often executed by professionals who represent another social class and frequently an incompatible interest. It is not surprising that responses of apathy, alienation, or hostility often result from the fact of powerlessness and are transmitted to children. A spirit of fatalism may, in such circumstances, be the best adaptation a person can make, though it places him in the double bind of being less able to take an initiative, should the opportunity to do so present itself (Banfield, 1968). Such responses, as they pervade home and community, are hardly likely to enhance a disadvantaged child's chances of functioning as expected by school.

a. Schooling Institutions. The teachers, administrators, and ancillary staff of many rural and inner-city schools are widely thought to lack the competence needed to do an adequate job. Although it is desirable that all children be taught by competent persons, a privileged student is more likely to have at home and elsewhere in his environment the stimulation and support which can enable him to learn even though he is not being taught well. Lacking such a buffer, the disadvantaged student needs to have the best teachers, those who are most skillful in presenting challenging academic content, who are best able to recognize and build on the strengths of poor children, and who are most likely to project attitudes and exemplify values which encourage and engage students. Precisely what constitutes such competence is not entirely clear, though there is some evidence that persons who are adept at teaching basic skills, who are consistent in their behavior, who like and understand low income children, who have time for planning, and who are philosophically attuned to a theory-based program of instruction are effective teachers (Gordon, 1971). Staff certification, however, is very much a function of other variables. A look at the pipeline described in Chapter II D, which feeds teachers into schools containing large numbers of poor students, suggests that an intervention effort designed to improve staff competence might need to occur in those institutions which have, through their historical actions as guardians of the educational process, acquired the power to select, train, employ, promote, and prescribe behavior for teachers. Certification of teachers and other school personnel is controlled largely by State Education Departments and college teacher education programs. These two groups also influence and in turn are influenced by the National Council for Accreditation of Teacher Education (NCATE). These groups will have to concern themselves with significant

changes in the credentialing process; alternative strategies which permit some loosening up of current practices may also have to be developed.

Dozens of books and articles dealing with the significance of a school's "philosophy" and "practice" are available; this matter is taken up in some detail in Chapter IV. With respect to the problems of academic performance and dropping out which affect the poor disproportionately, however, educators need to learn how to determine cause and effect in the context of other relevant variables, how to identify good practices for diffusion, and how to identify bad practices so conclusively that they will be discontinued.

The philosophy and practice of the school as a controlling institution, apart from its direct influence on students, has a discernible effect upon families and the larger community. Often the school takes a protective, authoritarian stance, rejecting or granting reluctantly the involvement of parents; it thus acts to isolate itself from the community and hence fosters the alienation and disengagement of poor families and their children, who may be striving to resolve a value conflict between what survival in their world requires and what the school demands as a condition of its rewards. The picture is more complex than this, however; the school is not merely an actor. Figure 2 in Chapter II illustrates this interaction.

For some students the expectations of the school and the community may be as important as the expectations of parents. The familiar Rosenthal (1968) study argues the significance of teacher expectation. Another experiment, conducted by Woodworth and Salzer (1971), came out with the following disturbing result: teachers in the study were negatively influenced by black speech and gave students lower grades than white students for identical compositions. In contrast, among Kohl's (1967) group of 36 children, several increased their reading level by two or three years during one year. Dennison (1969) and his fellow teachers also had experiences with remarkable student success. Yet the mystique of the disadvantaged child continues, resistant to opposing evidence.

The problem referred to in Chapter IV as the artificial separation of learning and life is especially acute for poor adults, who are far less likely than middle class parents to have an adequate education or access to good advice on jobs or family problems. Yet parents

who are plagued by lack of education and opportunity are often blamed for their children's inadequate preparation for school. While agreeing that a parent's involvement in a child's learning is necessary in U. S. culture, Scheinfeld (1969) and Ira Gordon (1969) argue that a parent who feels helpless to do anything about his environment is not likely to transmit a feeling of competence to his child. Schools who desire the involvement of parents ought, therefore, to provide educational counselling and perhaps other social services for the low-income community whose children they serve. Although taxpayers may be initially reluctant to support an extension of school services, an effort like this could pave the way for changing the current concept of learning as an activity for students and living as a separate activity for adults. The provision of such services has the potential for increasing parent involvement, decreasing the alienation between school and community, and enabling parents to effect desired changes in their life situations and that of their children.

b. Other Institutions. Although the school as a focus for community education can help promote opportunity for adults, its capacities are limited, and it is important to know what opportunities are available through other institutions. Employment opportunities within the community, for example, have a significant bearing on community life, as do on-the-job training opportunities, union regulations, rewards for efforts to attain upward mobility, and discriminatory practices in business and industry.

c. Governance. Related to the degree of opportunity provided or denied the poor by major societal institutions is the matter of governance. The distance of policy makers from the community is especially unfortunate for the poor who, compared with the middle-class community described by Cottle (1972), have few governing powers. It is useful to ask how middle-class and poor communities compare with respect to the degree of control over institutions an individual believes he has, the degree to which local institutions are actually governed by local people, the degree to which governance is imposed from outside the community, and the degree to which those institutions governed by groups outside the community reflect values and interests that are antithetical to those of the community.

3. Education's Failure to Understand Home, Community, and Peer Interaction.

Having recognized the importance of the interaction between subpopulations and controlling

institutions, it becomes necessary to observe how poor and minority families and communities adapt to an often threatening environment (of which schools and socialization procedures are a part), and to what degree minority groups share middle class aspirations and beliefs.

a. Family Structures and Child-Rearing Practices. Family structures and child rearing practices may be quite different in some ways from middle-class ones, though the degree of variance between minority groups is a matter of dispute (See, e.g., Ginsburg, 1972). Educators believe that middle-class family structure and child-rearing practices strongly influence, perhaps determine, a child's performance in school. The Coleman Report (1966), indeed, found family background the most important variable. The pragmatic problem then becomes not how to transform poor children into middle-class children but how to change the behavior of schools so that a poor child is not progressively penalized for the differences in his early environment.

The Kerner Report (1968) concluded that, in general, certain features tend to be present in low-income families: family instability induced by lack of employment opportunities and by punitive or inefficient welfare procedures; the tendency of the poor to have larger families; tired mothers who cannot give their children all the attention they need; absence of male roles for boys; and dependence on peer culture.

b. Peer Influence and Significance. Peer attitudes are widely held to be one of the most critical determinants of learning. In inner cities, peer influence may be even greater than in middle-class neighborhoods because of the living patterns which throw children together at an earlier age and for longer periods of time. The failure to comprehend the significance of peer group affiliation for minority adolescents and children is an increasing problem at a time when age-segregation and peer dominance seem to be on the rise in society in general (Sanford, 1967). Bettelheim (1969) speculates, in fact, that Americans are more or less unconsciously drifting toward certain Israeli kibbutz child-rearing practices, which work in Israel only because they were developed with forethought and conscious planning. As already noted, both Bettelheim and Bronfenbrenner have described societies in which peer group affiliation is deliberately manipulated to strengthen the society, and anthropologists who have studied gang formation in American cities have commented on the strength and solidarity of youthful groups. Yet American educational practice, with the exception of competitive sports, rarely channels the group activities of young people into

experiences perceived as having value to society or to individuals.

c. Family Education, Expectations, and Aspirations. Many of those in the vanguard of parent education (Weikart in Ypsilanti, Ira Gordon at the University of Florida, Hess and Shipman at Harvard, Scheinfeld in Chicago) consider a family's level of education, aspirations, and expectations critical to improving the life chances of young children. This variable is difficult to examine apart from community values since both adults and children reflect to some degree the world in which they live. It is important, however, to distinguish between one's level of education, one's *hopes* for one's child, and one's *expectations* from one's child. The Stanford Center for Research in Teaching in 1971 conducted interviews with low-income parents who revealed high aspirations for their children while simultaneously voicing little expectation that their hopes would be fulfilled. One must also take account of both education and non-education variables that affect aspiration and expectation: the effects of poor physical health (Birch and Gussow, 1970); the effects of parent aspiration and expectation as compared with peer aspirations and expectations; the effects of having one's belief in education as the key to success undermined by finding out that attending school does not equal education; and that educated minorities have lower lifetime earnings than similarly educated whites (See Tables A-8 and A-11). A related issue has to do with how a person who is not educated might obtain an understanding of what education, as opposed to years in school, actually entails.

d. Understanding Parent and Community Values. While educators recognize the need to match the practices of school with the values of particular communities, they have not been notably successful in achieving this goal, partly because it is difficult for privileged or majority-culture persons not to misjudge and misinterpret poor persons or those holding divergent cultural values. This in turn has led to the evolution of "the deprived child" mystique and is closely related to the lack of understanding about institutional behavior. The common failure to recognize divergence between professed values and actual behavior in the majority culture often results in ascribing similar divergences to the poor and minorities only, leading to such perceptions of "differences" from majority culture as "failure to understand the value of education" and "inability to defer gratification." When there is

discontinuity between what a community expects and what an institution understands to be the expectations of the community, confusion results, and misunderstanding occurs when a socioeconomic life style necessitated by poverty is taken to be a cultural life style. To avoid this kind of confusion, educators need answers to such questions as: To what degree are traditional American goals and values held by the people of this community? How is the implementation of such a value system perceived? What other values does the community hold? How closely does the value system of a particular home match the value system of the community?

e. Understanding Local Institutions. It is not common practice, except possibly in small rural communities, for schools to relate their practices and programs to a community's local institutions. Yet DuVose (1972) found in his studies of migrant Puerto Rican and Italian families that the strength and number of local institutions in a minority community are critical for most groups. For a long time, social critics have been writing about the prominent place of such institutions as the church, social clubs, and fraternal groups in minority communities. In providing an education for the minority student, it is necessary to consider the nature of his community's supportive institutions, their number and functioning. Such institutions may constitute a viable avenue for enhancing the education of youngsters—provided schools acknowledge and relate to the strengths of familiar institutions or cooperate with local people in developing institutions which will serve some of their needs and interests.

4. Education's Inadequate Response to the Increasing Awareness of the Shortcomings of School and Society.

The knowledge explosion and the mass media, particularly television, which have, in effect, altered the meaning of time and space, have also changed the nature of human perception, if such social observers as McLuhan and Toffler are correct. Certainly the political, cultural, and economic events of the last decade are reflected in the attitudes and actions of students in urban areas as well as suburbs. Schooling institutions cannot control the vagaries of society and the world, nor can those seeking to improve education, but they must achieve some understanding of how such events change people's perceptions and hence their educational needs. Programs in conflict with newly aroused social

consciousness or sense of ethnic identity are likely to prove ineffective, if not unacceptable.

a. Knowledge About Other Societies. Among the youth of this country, and especially among politically conscious minority youth, allegiance to traditional national values is increasingly viewed as a harmful form of parochialism. For a variety of reasons, young people today are more aware than their predecessors of non-western societies and cultural relativism. The fact that many students at all socioeconomic and academic levels have begun to express sympathy for emerging third world cultures is of major interest and significance for all educators, since it will require an education that is different in kind from what has traditionally been offered. Some institutions of secondary and higher education are, in fact, responding to this change in outlook. The discovery that other societies as well as their own have meritorious features has led some young people to be suspicious if not hostile to an educational system, which, wittingly or not, failed to teach them this fact. Such features as the nuclear family, private property, competition, and aggressive ambition no longer go unquestioned. The experimentation of middle-class whites with communal living and abolition of personal property is probably not without significance for minority activists who hold that some of the traditional institutional arrangements are inadequate for both the privileged and the poor.

b. Knowledge About Schools. The less privileged members of society have maintained for some time that those schools which serve them are deficient. The middle-class individual may be coming to this awareness later, and his basis for disenchantment may seem different. Today it is commonly accepted that many people believe schools to be inadequate, and it becomes less possible for minority groups to be convinced that the problem lies with them. Thus students, but especially poor and minority students, who might formerly have been docile but inarticulately discontented, are not without support when they insist that schools are not enabling them to learn what they need to know or helping them become all that they wish to be. To educational institutions which do not wish to change, knowledge like this is a problem. Further, it may blind some students to the fact that some institutions inside and outside the formal system are attempting to respond to changing perceptions and needs.

5. Subgoals for NIE

The societal, school, family, and community interactions analyzed above create social problems which NIE alone cannot solve. Nevertheless, it can and must deal with the issues central to improving education for the disadvantaged. The preceding discussion leads to the conclusion that NIE, in order to help schooling institutions attain desired educational goals for these populations, must be concerned with the component that impinge so strongly on their education, briefly delineated in Chapter II: characteristics of the entering learner; characteristics of institutional attitudes and perceptions; characteristics of home and community; and impact of heightened awareness of events in the larger society. Therefore, in addition to pursuing the quality sub-goals for disadvantaged as well as for all children and youths, NIE should concentrate on the following additional sub-goals in the priority area of improving education for the disadvantaged.

a. Acquiring and applying more authentic knowledge of the poor child.

b. Understanding and changing school and institutional action.

c. Adapting educational practices to the realities of home, community, and peer interactions.

d. Responding to heightened awareness of educational deficiencies.

Clearly, these subgoals form a tight network, and any attempt to deal with one will almost invariably impinge on several others. Nevertheless, some available knowledge and on-going work is relevant to each, but before surveying these activities, a brief overview of the makeup of poverty and minority groups will be given.

B. Target Population

By the guidelines established by the Office of Economic Opportunity, there are 26 million poor persons, 12.8% of the population. Such persons represent all races, though minorities account for a disproportionate number of the total, and are found in all geographic regions and in all demographic settings, with the heaviest concentration in the South and in non-metropolitan areas.

1. By racial breakdown, the poor are:

60% white, not including those of Spanish origin;

30% Black, though Blacks account for only 10% of the total population;

9% Spanish surnamed, though this group accounts for only 4% of the total population;

about 1% American Indian and Oriental.

2. The poor inhabit all areas of the nation:

45% live in the South;

23% live in the North Central region;

16.5% live in the Northeast;

15.5% live in the West.

3. The poor live in metropolitan and non-metropolitan areas:

47.6% (12.1 million) live in non-metropolitan areas;

32% (8.2 million) live in central cities;

Slightly more than 20% (nearly 6 million) live in suburban areas.

Though the target for NIE in this area is the poor and minority student, programs will affect other groups: School systems, universities, state and local education agencies, teachers, administrators, and students who are not poor. Therefore, programs must be designed in ways to enlist cooperation rather than opposition from those outside the target groups.

4. Recent trends indicate shifts in locations of the poor: about 53% of the total increase of the number of poor in the past two years occurred in the suburbs. However, the disparity in age composition at lower age levels continues: about 39% (10 million) of the total poor are children under 16 compared to 34% (70 million) of the total population who are under 16.

In considering how NIE subgoals apply to this population, it must be emphasized that it is not a monolithic entity, but is in fact characterized by many

different cultural and family patterns. For instance, the National NDEA Institute conference in 1967 carefully delineated the considerations necessary in dealing with the following quite different groups of children:

Appalachian
Mexican American
Migrant
American Indian
Central Urban Negro
Northern Urban Negro
Southern Urban Negro
Southern Rural Negro

Any programs designed to help schooling institutions meet educational goals for poor or minority children must be sensitive to the particular characteristics of each group and build on them insofar as available knowledge makes this possible. Where requisite understanding is not present, it must be developed or the programs are likely to fail.

C. Current Status of Experimentation and Development

Before considering program initiatives in response to NIE's priority of improving education for the disadvantaged, each subgoal will be examined in terms of the current state of knowledge and experimentation. Assumptions related to such work are explicitly stated and discussed in order to explore their validity and delineate important, but unexplored, questions.

Subgoal No. 1: Acquiring More Authentic Knowledge of the Poor Child.

a. The Poor or Minority Child is Different From the Middle-class child. Although Davis and Havighurst in a series of publications in the 1940's reported and dramatized the problems of poor and minority children, it was not until the 1960's that American education really "discovered" the disadvantaged child. Beginning with these studies (e.g., Davis, 1941; Davis and Havighurst, 1946; Havighurst and Davis, 1955), researchers have tended to concentrate their efforts to describe differences between disadvantaged and middle-class children on traditional psychological and social measures and on attempts to reduce these differences; they have spent relatively less energy on understanding the full range of individual characteristics and on developing programs which build from the child's strengths. For example, many studies

have demonstrated that on most current tests of intelligence, middle-class children score higher than do poor children; but only recently have investigators learned that whereas Anglo-American children tend to be field-independent learners, Mexican-American children tend to be field-dependent learners (Costaneda and Ramirez, 1971). The Coleman Report (1966)—one of many to do so—includes figures which show that, at any socioeconomic level, whites have higher achievement-test scores than do non-whites and Spanish-surnamed whites; but only recently has a series of investigations by Madsen and others (1971-1972) demonstrated a clear difference between Anglo-American and Mexican youngsters in the nature of their cooperative/competitive behavior. In another recent study, St. John (1971) has shown that black youngsters made relatively greater growth in reading scores with child-oriented teachers than they did with task-oriented teachers.

b. All Poor and Minority Children are Similar to Each Other. Many studies, for example, the AERA-sponsored summaries of research on "Education for the Disadvantaged" (*Review of Educational Research*, 1965 and 1970), even in the 1970 volume, have tended to group all "disadvantaged" or all "poor" or all students of one ethnic minority together in making comparisons with middle-class children, who, in turn, appear to be assumed to have common characteristics. Both researchers and sensitive educators are becoming more aware of the fallacies of this assumption, as noted above, but much further work needs to be done to relate group characteristics to viable instructional strategies.

c. Early Intervention Reduces Educational Failure. Interest in improving the position of the disadvantaged child in relationship to the middle-class youngster was given great impetus by passage of the Economic Opportunity Act in 1964 and the Elementary and Secondary Education Act in 1965. Educational programs were built on already extant research: the power of early intervention documented by the Skeels study, and its various follow-up reports (1938-39; 1966), Grey's program (1970) with low-income children incorporating interventions with both children and parents, and Weikart's (1961) Perry Preschool Project with retarded children. By the time Head Start was introduced in the summer of 1965, the work of Skeels, Grey, Weikart, Deutsch and others provided a basis for planning as well as a source for encouragement.

Promising experimentation may lead too quickly to generalization, however, and significant problems

remain. Many researchers caution that their conclusions are tentative. The work compiled and edited by Schreiber (1967), illustrating the complexity and ambiguity of the whole area, contains discussion by people of good will who differ radically in their perceptions of low-income students. Ginsburg's (1972) recent book analyzes conflicting findings and warns against an ethnocentricity that can blind educators to the reality of poor children. Emphasis on the importance of early experiences also may lead to failure to provide adequate opportunities for older students. The most encouraging feature of much current research may well be its emphasis on the essential normalcy of children who are poor or not white or both.

Subgoal No. 2: Understanding and Changing School and Institutional Actions.

Major efforts have been launched to make schools more adequate, supported by Federal funds through the legislation cited above and also through local and private foundation funding. Though most of the support has been aimed at changes within the system, some of the most effective innovations, such as the street academies and Harlem Prep, have occurred outside it. A number of programs in compensatory education have addressed the problems of staff, philosophy and practice, and resources of existing schools. But since most evaluations have focused on the student rather than the school as the element requiring change, and since evaluation methodology is deficient, it is difficult to extract from the available data the kind of definitive information needed for effective educational reform (See Gordon, 1971). The following assumptions undergird much of the past and current experimentation:

a. Better Staff Must Be Provided. The MAT programs seemed to attract and train good teachers, but the teacher dropout rate in that group is high. The TTT (Trainers of Teacher Trainers) program is not commonly considered an unqualified success, though it has strong advocates in some areas (Rodgers, 1971). The success of Teacher Corps is difficult to assess, though its supporters maintain that funding difficulties and political problems have reduced its effectiveness. The most promising development appears to lie in more radical departures from established practices: using paraprofessionals from local communities (tried in Head Start and Follow Through programs), hiring non-certified persons with academic or practical expertise (Jontz, 1968), fostering peer tutoring programs (Harlem Prep) and using community people as resources (Parkway Program, Copley Square High School).

Attempts to alter overall state certifying procedures—as contrasted to specific requirements—have not been tried systematically. Although teacher training institutions have experimented with varying instructional methods and course packages, neither they nor other agencies have been substantially involved in developing broadened certification standards. Yet it is the children of the poor whose education and life chances are most jeopardized when they are taught by persons whose education and socialization do not include adequate skills for understanding and dealing with their students. A related problem concerns teacher dropout patterns: anthropologists like Burnett (1971) have observed that inner-city education tends to discourage teaching excellence, leading outstanding teachers to leave the system.

School systems across the country have tried in-service training as a way of improving teacher performance, but this appears to have had limited success. In some systems, contracts now call for payment to teachers for time spent in training, which makes in-service activities costly. In any event, such training does not always improve performance, because the academic credentials required of a teacher trainer frequently eliminate innovative projects. Frequently, the institutional response to the accusation of teacher inadequacy has been “more is better”—more specialists, more counselors, more education courses, more degrees. The public schools have not usually tried alternative reward schemes which would keep the best teachers in the classroom, possibly because rewards would have to be based on someone’s judgment of performance, rather than on the quantifiable criteria of degrees and longevity. Such a practice might, however, provide teachers with considerable encouragement and incentive. Nor have secondary schools initiated student evaluations of staff on any significant scale. Since supervisors and peers may disagree on what constitutes good teaching (as evidenced by the dry objectivity of many evaluation forms), there is all the more reason to let students cast their votes. Some of the more experimental colleges are now including student (and alumni) ratings in their faculty evaluations.

b. The Implications of School Philosophy and Practice Need Better Understanding. Title I, Head Start, and Follow Through launched massive programs to change the practices of classrooms, schools and school systems, but these efforts—though considering perceived characteristics of the target populations—were not usually the result of prior systematic study of existing

practices. Head Start and Follow Through provide a rich source of data, however, and NIE might find that a cooperative effort with these programs would result in useful information. In the context of these activities, for example, national experiments with a variety of educational programs are being conducted, ranging from the open classroom approach to the Englemann-Becker behavior modification techniques. Evaluations of such programs generally tend to focus on the amount of change occurring in poor children. Potentially even more interesting for purposes of research, however, is the institutional change goal of these programs and the actual changes occurring in institutions. This is an especially critical area for study at a time when the political realities converging on compensatory education do not always favor such an emphasis.

In order to test some assumptions about school organization, several school districts have experimented with community-based programs of instruction for secondary students. New York City’s Higher Horizons Project made a classroom of the city, and Philadelphia’s Parkway Program has expanded this concept, creating a school without walls. Satellite Academies in New York City, supported through the Career Education Program, provide students with experience and educational opportunities in the business and industries of the area. One of the more impressive alternatives to the system is Harlem Prep, which has had astonishing success in preparing inner-city students for rigorous academic work. But these efforts are few in number and apparently have not instigated significant change in the system.

Goodman, Friedenberg and S. M. Miller (Schreiber, 1967) have made strong indictments of current practices, describing many of the same ill effects which are discussed in Chapters III and IV above. Public school teachers who have left the schools and reported on their experiences and perceptions have also provided an ample store of anecdotal evidence. It remains, however, for an agency with sufficient resources to collect, synthesize and make available all that the best practitioners and scholars know about the interactions—for good or ill—of philosophical orientation and teaching practice.

c. Society’s Expectations Must Be Changed. Any attempt to deal with the problem of an inadequate philosophical base necessarily involves the area of expectations, and here the evidence of progress is sparse. In spite of the work of Rosenthal (1968) and others, the institutionalization of a theory of learning which does

not base expectancy on race or social class has not occurred. Ginsburg's (1972) recent synthesis of available evidence, if widely read by educators, may have some impact, but experience indicates that one of the most stubborn problems in educational reform has been the utilization of available knowledge (Cohen, 1971).

The problem of low expectations for some students is inordinately resistant to solution because so much of seeming "common-sense" perception is involved, and it is difficult for most individuals to free themselves from their own assumptions and cultural boundaries. Within the public schools, however, there are teachers who have surmounted these cultural limitations. Dennison (1969), Kohl (1967), Kozol (1967), Ashton-Warner (1963) and Herndon (1968) have written detailed accounts of how they learned to perceive learning potential and create situations that capitalized on it. It is difficult to know how many less well-known teachers have done likewise, though the evidence suggests that their numbers may not be great. Ginsburg's work is an urgent plea for the abolition of widespread assumptions that the poor child has been so damaged by the time he comes to school that he will, in most cases, remain behind through his years in school. In support, innovators like Johtz (1968) and experience with several of the NSF-supported curriculum projects have demonstrated that poor elementary school children can learn and enjoy rigorous intellectual material like higher mathematics and science concepts and processes, disproving the belief that abstract thinking is beyond the ken of such children.

d. Schools Have Inadequate Resources and Facilities. This appears to be one of the variables impossible to evaluate apart from others. The Coleman Report (1966) indicated that such resources as libraries and overhead projectors do not make a significant difference in total school achievement, though their effects on individual students were not studied. The emerging alternative schools are often resource-poor by most standards, yet their small size and low teacher-pupil ratio may compensate for lack of equipment. Moreover, since many of them operate in a community setting which is used as a resource, they may not need facilities which are necessary in large schools. (A recent example illustrates the trap that educators may fall into when research studies are widely publicized, but not carefully read: in one northern city, the school board has proposed increasing the teaching load and adding a class to all secondary school teachers' assignments, citing the Coleman Report as justification.)

e. The Effects of Dominant Institutions and Government Policies Are Not Understood. Some of the more convincing suggestions that education study itself and the society in which it is embedded have come from anthropologists and economists involved with the NIE planning activities. L. Nader, for instance, describes the results of student studies of such institutions as the insurance industry and the Better Business Bureau and develops a rationale based on current and past research that the real gap is in "studying up" (i.e., studying the dominant structures and major groups of society) rather than in "studying down" (i.e., studying the poor) which has received most of the emphasis. Bowles (in a paper prepared for Bowman, *et al.*, 1971) discusses the societal and educational implications of the presence of growing numbers of blue collar, poor, and minority students in colleges and universities. For educators and educational policy makers, however, this is largely unexplored territory.

Current experiments in community control are perhaps the best source of data on the effects of shifting governance from remote institutions to the local level (Greenberg, 1971). The Kerner Commission Report (1968) provided much useful information on poor families and suggested a number of remedial actions. There is, however, no parallel commissioned national study on major institutions. Nor do most elementary and high schools offer the kind of civics, government, or economics course that provides for such study on an individual basis. Even colleges, by and large, do not encourage their students to study up systematically.

Subgoal No. 3: Adapting Educational Practices to the Reality of Home, Community, and Peer Interactions.

a. Parents Must Be Involved. Encouraged by the early studies of Davis and Havighurst, a number of educators like Scheinfeld, Hess and Shipman, Grey, and Ira Gordon, have developed programs designed to teach parents how to encourage positive learning traits in their children. Most of the Follow Through sponsors have also built a parent-involvement component into their models. A significant part of the rationale underlying the work of Ira Gordon (1969) and Scheinfeld (1969) is that something should be provided for poor parents as well as for their children. Gordon's Follow Through Model uses paid paraprofessional parent educators from the low-income community to work with both parents and teachers in bridging the understanding gap, and Scheinfeld followed a similar procedure in hiring some

of the poor parents whom his staff had trained to work in his project. Success stories coming from these efforts appear impressive: some of Gordon's paraprofessionals conduct seminars for his graduate students, and the mothers who received pay and recognition in Scheinfeld's project became proficient in teaching their own children.

There is, however, dispute among educators and others as to what actually occurs in low-income homes. Further, evidence is accumulating of differences among and within subgroups along this dimension. Ramirez' recent studies (Costaneda and Ramirez, 1971) of Mexican youngsters, for example, suggest that their socialization procedures may be different from those of other low-income groups. Undoubtedly, there are differences between the home life of farming families and inner city families, though they have not been well documented. It is possible that a great deal of experiential knowledge resides among those now working in experimental programs for the disadvantaged. Follow Through is perhaps the most inclusive example of an attempt to work within a variety of low-income communities and may be a source of valuable information about specific family characteristics. Ginsburg's caution, however, remains critical: educators must not see or assume practices that are not present. He strongly disputes Hess' (1967) conclusions about the differences between poor and privileged mothers and urges educators to reconsider their perceptions.

b. Peer Group Affiliation Can Add Strengths. Outside the domain of public education, a number of programs designed to use peer influence for positive ends have been initiated. Minority adolescents in cities are often involved in drug prevention programs, and such groups as the Black Panthers have fostered the involvement of youths in serving the Black community. Peer tutoring is a vital part of Harlem Prep's program and is used in a number of compensatory education programs, including some Follow Through projects. Most public schools, however, have not used the tremendous potential of this phenomenon, preferring the traditional safety valve of supervised extra-curricular activities. The practices of other countries in this respect, as already noted, could provide useful input to a reconsideration of the role of peer groups in attaining or frustrating educational goals.

For the educators of minority youths, studies of peerinfluence could provide a better understanding of

their students. Research will not, however, resolve the value question society now faces—whether to encourage and capitalize on peer affiliation or reduce its importance by reducing isolation of adolescents from adults.

c. School and Community Should be Integrated. Since adequate information about specific subgroups is not widely available to educators, attempts to integrate school and community life frequently produce tensions and reveal hostilities. The 1968 confrontation between the parents of Oceanhill-Brownsville and the New York City teachers' union provides a dramatic example of conflicting values and perceptions emerging in settings where education and politics are closely linked. I. F. Stone's commentary (1968) points out that the conflict was essentially a political power struggle over who could grant or take away rights to make decisions. In such a struggle, educational considerations often end up last. Schools, in attempts to avoid such confrontation, do sponsor parent education and parent-involvement programs, but these may be as often in the nature of public relations as for the purpose of encouraging schools to respond to the institutions, values, and life patterns of specific communities. Participating systems in the Experimental Schools Program presumably do attempt to match the needs and values and life patterns of specific communities, but sufficient information about this recent effort is not available as yet to gauge their success.

One of the most interesting examples of integration of school and community comes from another country. The Israeli kibbutz, as described by Bettelheim (1969), probably could not be replicated here, though some features of kibbutz learning might be viable in an American setting.

d. Separation Between Learning and Life Must be Reduced. Most large school systems have adult education programs, but they are not always widely available or adapted to the needs of poor individuals. Community schools, which are predominantly elementary, do not ordinarily provide services for the parents of their children. Project Know How in Tampa, Florida, does attempt precisely this, however, and should be a good source of information on the results of such practices. The Residential Career Education Model at Glasgow, Montana, a USOE experiment in job-training for adults, may also provide useful input for schools wishing to serve adults.

Anecdotal evidence abounds on informal efforts by individual teachers and administrators, though their extent is unknown. Such efforts are usually conducted outside normal channels and constitute an additional burden for staff, emphasizing the need for more systematic arrangements.

Subgoal No. 4: Responding to the Increasingly Prevalent Awareness of Social and Educational Deficiencies.

There are few encouraging indications of initiative in this area, since it is difficult for schooling authorities to respond adequately to the phenomenon of increasing student and parent alienation from their leadership. Educators who are concerned about inadequate responses share some common assumptions about reasons for this difficulty.

a. Large Bureaucracies Are Inflexible. In large school systems, and even frequently in small ones, classroom teachers and administrators are not ordinarily given much autonomy. Requests to deviate from standard procedures or innovate in curricular matters must often pass through many channels before being acknowledged, honored, or denied. Gallant and Prothero (1972), in discussing higher education, note the following impediments to responsiveness in large institutions: administrative complexity, need for intermediaries with resulting garbling of information, absence of community, overspecialization, and diffusion of responsibility. As already pointed out, the response of many concerned students and teachers has been to leave the public schools altogether and establish alternative schools.

b. Teachers and Administrators Do Not Have The Necessary Knowledge. Many of the people who staff the schools—and this is especially critical for secondary schools—do not have the background knowledge that would enable them to supervise serious intellectual investigation of the social problems occupying their students. Nor are they generally encouraged to follow scholarly pursuits themselves, except insofar as opportunities are provided through such channels as NSF-supported in-service education. The states and localities which require refresher courses for continued certification more frequently than not prescribe within rather narrow limits the nature of acceptable course work. Other factors impinging on current staff inadequacy have been discussed earlier in this report.

c. Students Do Not Have Enough Say in Their Own Education. Although critics like Bowles (1971), Silberman (1970), and others referred to earlier are concerned that educational institutions do not adequately consider the desires of students to participate in those decisions which determine educational outcomes for them, progress in incorporating their input has been sketchy. A number of court cases have ruled in favor of student rights, hence encouraging some schools to involve their students in decision-making activities, including appointments to School Boards. The degree of their influence remains to be evaluated as such practice matures; in any case, it is more common in areas populated by upper and middle class than by poor or minority students.

d. Poor Parents Do Not Know How to Exert The Covert Monitoring and Control Over Schools Common in The Suburbs. E. Blake of the Institute for Services to Education, during the Conference of Curriculum Developers (Robinson, 1972) sponsored by the NIE Planning Unit, made a persuasive case for the fact that lower-class parents do not know how to hold schools accountable, but that suburban parents conduct all manner of subtle checks and exercise sometimes visible but often covert control over the performance of their children's schools. In his view, one of the most important initiatives would be to teach inner-city mothers to check up on homework and tests, talk with their children about their day in school, complain to teachers and principals about injustices and poor staff performance, and so forth. Through this monitoring a visible constituency would be created, one which the school system could ill afford to ignore.

D. Research and Development Initiatives

Every examination of the problems in education for the disadvantaged has revealed that corrective action must be aimed at more than just the child, or just the school, or just the parent. Therefore, the programs suggested below attempt, for the most part, a systemic approach to the network of interrelated causes of educational failure, recognizing, however, that the root problems of poverty and discrimination cannot be addressed in the context of education alone.

1. Multidisciplinary Design of Alternative Educational Programs

a. Basic Idea. Design and trial of comprehensive educational programs, typically of the

scale of a whole school or school system, by multidisciplinary groups including psychologists, sociologists, economists, parents and other community people, management scientists, talented school people, and persons from various subject areas. The program grows out of a recognition that the virtues of centralism are frequently offset by a resulting homogeneity, which does not reflect unique educational needs and values of particular students and communities, and that viable alternatives within the system are desirable.

b. Examples. Design components to which persons from various fields could contribute include:

Sociologists and anthropologists:

School-family interaction;
School-community interaction;
School psychology of
student-student, student-teacher,
and teacher-administrator
interactions.

Psychologists:

Motivation—intrinsic and extrinsic
to learning activities;
Individual differences in capability,
learning style, temperament;
Developmental stages in students.

Members of the community to be served:

Knowledge of community needs
and problems;
Knowledge of their own children's
values, needs, and expectations;
Perspective on school behavior as it
relates to the community.

School People:

Things that have worked with
children;
Practical problems of teachers and
administrators and how they can be
overcome;
Trial of new ideas in real settings.

People in alternative school movement:

Effective ways of working with
community;

Practical experience in establishing
new schools;

Knowledge of process and
problems.

c. Program Description. This program calls for a kind of cooperation which has few if any precedents in education. It requires first rate people with some knowledge of education but without rigid prior commitment to a particular educational model; adequate time for ideas to be developed and tried out in an orderly fashion—a long term commitment but with the understanding that the proposers may decide to change drastically the original plan or to abandon the project on the basis of careful preliminary experimentation; substantial funds for research and development; and continuing concern with eventual adoptability, including funds for development of teacher training programs, etc., in later phases of successful experiments.

Each design will make explicit its parameters, e.g., population to be served, size, financing, educational philosophy, and will synthesize the knowledge and perceptions of the fields from which the participants come. Evaluation and feedback in the project will involve various perspectives and methodologies. These projects, while related to the OE Experimental School projects, will differ from them by not arising out of local school districts alone, by multidisciplinary participation, and by greater attention to and greater resources for development.

It would appear that only a major university (or an educational laboratory drawing upon one or more universities in its vicinity) coupled with a nearby school system could provide the combination of highly talented persons from several disciplines and long term stability required by projects of this sort. Once such a working arrangement is established, one can anticipate the development, at least in some cases, of a new order of cooperation between the university and the school system amounting to an Experimental School System Project. Serious long term commitment by several departments of the university beyond the school of education would be essential. Previous experience suggests that establishing such university-school system relationships would require some shopping around by an interested university. NSF experience with college-school cooperative programs involving science rather than education departments has been very favorable.

d. Actions. The NIE planning phases will include:

1) An interdisciplinary meeting devoted to exploring ways in which the disciplines might cooperate in design of new educational programs. An NIE planning group member should be assigned part time to see that the meeting produces materials that fit with the overall planning scheme. These products could include some concrete examples of school programs that might be developed, mechanisms for their development, names of likely persons and institutions, and suggestions for next steps.

2) A preliminary survey of previous experience with interdisciplinary and university-school cooperative projects. Inputs by administrators of relevant programs of Federal agencies and major Foundations and by directors and participants of cooperative projects should form a major component of the survey.

3) A summer study involving the range of persons called for in the program description including groups from potentially interested universities, communities, and school systems. Output of the study would be a report in which several possible designs of educational programs involving insights from various disciplines would be set down in some detail with suggestions for further development. Some of the participants would in all likelihood submit proposals for planning or exploratory development grants which would be reviewed on their merits. The report could form the basis for an invitation for other proposals in later years.

In the NIE operational phase, the program will operate somewhat like the present Experimental Schools Program with general solicitation of proposals for planning grants leading to a smaller number of grants for operations—perhaps in more than one phase, such as exploratory development followed by a full operational grant. It will be necessary for NIE to take an aggressive role in soliciting proposals through meetings and other means, since suitable groups of the sort envisioned generally do not exist as entities at the present time.

Much of the OE Experimental Schools Program fits into this activity, but the design of new schools and new school systems will focus exclusively on improving

schools in poverty areas and serving minority groups, at least in the first few years. If an intensive study can be conducted during summer, 1972, five to eight planning grants will be made in fiscal 1973 at a cost of \$100,000 each, and three to five designs funded for development in fiscal 1974 at \$1 million each. These costs are in addition to relevant components of the existing Experimental Schools budget.

2. Developing Educational Elements

a. Basic Idea. Pursuing in systematic fashion the development of the most promising elements that have worked in the education of the disadvantaged so that they can be easily adopted in existing educational settings. The features that usually limit this type of effort need to be recognized in the program design; that is, once a successful element is propagated beyond its original setting, it may not have the same effect. There are, nevertheless, several educational elements which appear to produce good results in a variety of situations and, given an understanding of the characteristics of a particular setting, should be broadly applicable.

b. Examples. Examples of educational elements include:

1) Activities that (a) are fun in themselves, and/or (b) motivate through interesting subject matter:

Games (David Page math, Hopkins R&D Center)
Computer activities (Papert-MIT; Truxal, Braun-PIB)
Reading interesting, attractive books of one's own (McNamara-Reading is FUNDamental Project)
Music (Manhattanville Music Project)
Writing about one's life and neighborhood (Kohl, 1967)
Recording local folklore (Eliot Wigginton, *The Foxfire Book*)
Dancing, poetry, painting (Artists in the Schools - Arts Endowment)
Construction Activities (EDC Triwall and cardboard carpentry)
Studying growth of plants (Elementary Science Study)

Products would incorporate tested procedures with emphasis on low cost materials

(preferably locally available) and carefully worked-out practical advice to school officials and teachers on installation, including teacher training.

2) Tutoring or instruction by older students as a means of improving learning of both. Product would be succinctly written discussion of what has been accomplished in various settings under various conditions, with practical advice on all aspects of establishing programs of various sorts based on a combination of independent observation and experience of original developers.

3) Use of persons in professions, industrial and other concerns, clubs and organizations, etc., as instructional resources. Developed, studied, and made transferable as in 2) above (also related to Program IV-2).

4) Use of paraprofessional persons in the neighborhood to work with individual children and parents and in classrooms. Developed, studied, and made transferable as in 2) above.

c. Program Description

1) Development of Existing Elements. First, a study will be contracted searching for best examples of major approaches that have been obviously successful on the basis of such criteria as arousing intense interest in a number of students, dramatic changes in school atmosphere, teaching new things, or making marked increases in performance on standard tests. The search will be carried out through: solicitation of information from knowledgeable people, including NSF and Arts and Humanities Endowments; ERIC Center on Disadvantaged; search of the research and popular literature; site visits to innovative schools. Whenever possible, evaluative information will be collected. An analytical paper will be prepared and reviewed by highly competent consultants including practitioners and scholars.

Second, proposals will be solicited for full development of the most promising approaches in projects involving successful creators or adapters of each approach and experts with deep knowledge of settings where it is to be applied. Regional Laboratories may be involved in cases where they have expertise in a particular approach. Development projects will include installation in

new sites and analysis of what is needed to insure successful installation. Smaller preliminary grants might be appropriate if reviewers felt a need to be surer about the potential of the approach.

2) Development of New Elements. Proposals would also be solicited for exploration and development of new means of fostering learning in poor children. Only projects aimed at and giving promise of major changes in student learning or attitude would be supported. A number of small grants for preliminary exploration of promising ideas would lead to a smaller number of major developmental projects, some of which might incorporate the results of more than one exploratory project and ideas already tried out as well. Both facets of the program should be carried out in close cooperation with NSF and the Arts and Humanities Endowments, which are both supporting pertinent work in this area.

d. Actions. The NIE planning phase would carry out the search and preparation of the paper described above. This could be done by contract with several centers of expertise or within the intramural research program. An early version of the paper could serve as partial background for planning exploration of some new elements. The paper, a compilation of information about instructional elements successful in teaching poor children, would be valuable whether or not this program is adopted.

The NIE operational phase would be aimed in two directions:

1) Development of Existing Elements. Proposals for full development of promising approaches will be solicited for specified elements that are regarded as most promising on the basis of the study carried out. Other elements would be considered but would be given priority only in extraordinary cases. Proposals would be selected for support on the basis of evidence provided on likely gains to be expected, validity of plans for integration into specified settings, quality of persons to be involved, and developmental design as judged by consultants individually and in panel meetings.

2) Development of New Elements. Prototype elements could be developed through summer study involving very capable practicing

scientists, engineers, artists, lawyers, etc., talented teachers and educational researchers, media experts, and individuals with understanding and experience in the education of poor children. Output of the study would be a report describing in some detail the characteristics of promising new approaches. Some of the participants are likely to submit proposals for further development of some of the successful elements. The report could form the basis for an invitation for proposals in future years. Joint sponsorship of the summer study by NIE, NSF, and the Arts and Humanities Endowments would provide an excellent means for involvement of a broad spectrum of capable people and coordination and concentration of Federal programs.

The budget for both aspects of this program should be sufficient to allow for effective and broad scale installation. For fiscal 1973, this would require \$300,000 for adaptation of each existing element; in fiscal 1974, the budget should include development of several new elements at \$1 million per year.

3. Multidisciplinary Problem-Oriented Courses for Adolescents

a. Basic Idea. This activity has been mentioned in connection with quality goals in Chapter IV; it is described here because of its special long-range promise for constructive change in relation to educational and other social problems having impact on the disadvantaged. The program could also be considered an element of Program V-2, but it is intended to address not only the poor but also other adolescents with strong social concerns. The aim is to provide accurate factual information about society and its institutions ("studying up"), so that the idealism of youth can be harnessed to sound perceptions. Improved understanding of the complexities of society may provide future and young citizens with better tools to work for desired social gains while decreasing alienation.

b. Examples. The knowledge base includes: history, sociology, political science, anthropology, economics, ethnology. Appropriate methods of study might include: reading assignments, group discussions, field investigation, casework, preparation of a socially useful product (e.g., course units for poor elementary school students, compilation of information on air pollution, study of local tax base, survey of opinions about reporting of community news).

c. Program Description. The development of instructional modules for teaching authentic understandings of social institutions would involve the cooperative efforts of persons representing the disciplines listed above. Prototypes have been created in the series of pamphlets for students and teachers developed by the American Sociological Association (described in National Science Foundation, 70-18). A much greater variety of teaching methods must be incorporated, however; the program should allow for flexibility in responding to the characteristics of different types of students. For the most part, there would not be a pre-packaged set of materials but rather a compendium of information that could be adapted to unique situations, together with many rather detailed suggestions for student activities and for tapping into the resources of the community, where appropriate. Repeated trials of the materials and resulting reports would add to the store of suggested teaching approaches and relevant experiences for student use. The whole package of base information and instructional techniques should be amplified by guidelines on appropriate organization of student time and staffing patterns, allowing for flexibility in curriculum choices (a student might spend 30-50% of his time on this activity and be relieved of some standard course requirements) and interdisciplinary teaching. If skillfully implemented such a course could affect the entire curriculum and generate a desire for creating more meaningful learning opportunities throughout the school.

d. Actions. Launching such a complete instructional development in the NIE planning phase will require two stages:

- 1) A series of planning meetings, involving social scientists, outstanding teachers, curriculum developers, media specialists and students to design the initial structure and suggested topics for more intensive development.

- 2) On the basis of these plans, specify program guidelines and evaluation criteria which will encourage novel approaches to the creation of the problem-focused curriculum modules that are the objective of the program. A prime consideration must be maintenance of a high degree of flexibility and adaptability to a variety of high school situations.

In the NIE operational phase, proposals will be requested and, with the assistance of persons from

agencies and institutions with experience in multidisciplinary efforts, the best will be selected for funding. It is quite likely that an intensive period of proposal development involving both prospective grantees and contractors and NIE staff will be necessary before a fundable series of projects can be designed. Particular topics not covered in response to the request for proposals should be developed through contract. Considerations in evaluation should include: (1) completeness and flexibility of design; (2) plan for testing and evaluation; (3) degree of inter-disciplinary and social issue orientation; (4) inventiveness of teaching strategies; (5) quality of personnel to work on project; and (6) feasibility. Cost of the program is anticipated at \$1.5 million in fiscal 1973, and \$3 million in fiscal 1974.

4. Anthropological/Sociological Studies of Teachers, Schools, and Communities

a. Basic Idea. The focus of this program is to increase the ability to remedy educational failure by applying knowledge gained from systematic observation and study of good practice and of the milieu of specific communities in which poor children are receiving less than adequate education. Whereas researchers have made several attempts already noted to study the atmosphere of classrooms and the behavior of individual teachers, little work has been done in relating these matters to the communities in which the schools and teachers operate. The NIE studies would be designed to assist in matching practices and procedures with the values, beliefs, and life styles of specific populations in order to make education for their children supportive and effective.

b. Examples. At the preschool and elementary school levels, NIE has at this time an opportunity to take advantage of the information being provided by the Head Start and Follow Through programs, which possess great potential as a laboratory for learning more about (1) different groups of disadvantaged children; (2) the effects of different intervention programs with varying subsets of children; (3) problems and processes involved in introducing intervention programs, including such critical issues as the reaction of the system to the new program, and the interaction between parent groups, the new program, and the system; and (4) longitudinal effects of intervention programs. Since Head Start does not have the same natural relationship to NIE that Follow Through does, funding extensive research related to Head Start may be difficult. Funding research related to Follow Through should be feasible, but careful, coordinated planning will be essential.

At the secondary school level, there is unfortunately no such national experiment with which NIE might link up. Nevertheless, since gaining an understanding of education and the community requires the observation of the behavior of teacher, school, and community as they relate to adolescents, NIE should sponsor research in this area also, with particular emphasis on the schooling-work interface as related to community milieu.

At the higher education level, as recent attempts to serve new client populations have demonstrated (e.g., Livingston College of Rutgers University, SUNY College of Old Westbury), an understanding of the life-style and expectations of these new student groups is crucial to the success of any institution which they attend. A number of other facets also bear further examination: the milieu of the Black Colleges of the South, the adaptive behavior of both majority and minority groups attending elite institutions, the effects of open-admission policies at formerly restrictive institutions such as CUNY. Retrospective studies of college graduates, as mentioned in Program IV-6, should be coordinated with these activities.

c. Program Description. Program guidelines will spell out the focus of the research to be conducted, but most projects will be selected from unsolicited proposals addressing the program objectives. Some studies may be specifically solicited in order to fill in obvious gaps in coverage. Since studying the poor is a highly sensitive practice at this time, research proposals will be evaluated on degree of cooperation likely by participating schools and communities, in addition to the usual criteria. Anthropologists are perhaps the only group of scholars with a tradition of studying other cultures, where they are possibly unwelcome, and their experience is that trust and acceptance require time. For this reason NIE could not count on short-term results. Teachers who participate in such studies will have to feel confident that information gained will not be applied punitively, and communities will need incentives if they are to participate, for instance, a belief that such studies will help remedy educational failure.

This program is part of an overall effort by NIE to broaden the base of education by drawing on the knowledge available through other disciplines; the application of the information provided by the suggested studies would reflect this aim. The insights derived through anthropology and sociology should become a part of instructional processes and teacher training programs, and also be made available to school districts,

citizen groups, and others interested in the welfare of students. The degree of effectiveness in integrating school practices with community values and expanding a community's understanding of its own educational needs will depend on the quality of the research supported and subsequent dissemination efforts.

d. Actions. In the NIE planning phase, a group of behavioral scientists including anthropologists, social psychologists and sociologists will be convened to assist the NIE staff in developing guidelines for the program and defining the most crucial areas for research. In particular, evaluation criteria must be developed that will be sensitive to the difficulties of studying either the schools or poor communities. Contact should be established with Follow Through staff, Follow Through program sponsors, local projects, and the research community so that research efforts will be coordinated to take advantage of this opportunity to conduct research on intervention programs with disadvantaged children. Dissemination methodologies for the different audiences must be planned similar to those for Program IV-6, but with an added emphasis on providing useful information to the poor or minority communities involved and assuring availability of the data base to interested researchers.

In the NIE operational phase, this program deals with basic research targeted to develop understandings in a very specific domain. Both unsolicited and solicited studies will be supported. A broadly-drawn advisory and evaluation group is crucial to the success of the program, so that a variety of perspectives and research methodologies are represented. Components of the existing NCERD research efforts can be incorporated into the effort; in some cases existing R&D Centers (such as the one at Johns Hopkins) are likely grantees or contractors. Costs for the program will be dependent on the number of studies to be supported. As demonstrated by the disciplinary meetings (anthropology, sociology, psychology) held by the NIE Planning Unit, a number of social scientists are ready to undertake this work, though developing adequate research plans will take some time. A minimum of \$2 million should be invested in this program in fiscal 1973; costs could rise rapidly if extensive community investigations are undertaken.

5. Compilation and Analysis of Knowledge Concerning Failure of Education System with the Poor.

a. Basic Idea. Increasing Federal and local ability to remedy the failure of the educational system

with the poor by systematization and analysis of present and future knowledge in a way that will be useful to NIE personnel, extramural R&D personnel, government officials and other persons concerned with education. The contradictory nature and lack of systematization of knowledge bearing on education of the poor and other problems have become apparent during the planning of NIE. The analytical framework would be designed to be generally applicable to other problem areas with which NIE will be concerned, but the failures discussed in this section will receive the highest priority because they cause the most damage. The aim is to replace the present unfocused style of attacking educational problems with an approach toward a science and technology of education in which understanding accumulates.

b. Examples. A constantly growing and changing, multilayered compendium would be produced including:

1) Current knowledge (e.g., Coleman data, Gordon evaluation, Ginsburg synthesis, experience of radical innovators, Head Start and Follow Through, Jensen, Rosenthal), how it was obtained and its reliability—including analysis of inconsistent viewpoints;

2) State of the educational system as it relates to students from poor families and how it is changing;

3) Results from anthropological studies conducted under Program V-4;

4) Current research plans of Federal (and possibly other) agencies and description of individual projects, giving their objectives and how they relate to existing knowledge and to research plans.

The compendium would provide a comprehensive framework of significant dimensions bearing on education, into which pertinent knowledge and information in problem areas could be fitted (new dimensions being created as necessary) and would be layered in such a way that the user could move from a succinct overview to increasingly detailed discussion and finally to individual scholarly articles or reports. The compendium would resemble scholarly review articles or an encyclopedia but would differ in its focus on problem areas, in the existence of a single comprehensive framework relating treatments of different problems, in its cumulative nature with continuing updating as

opposed to fresh starts, in its more impersonal nature achieved through review by a variety of experts, and in its attention to research plans and opportunities and to means of achieving educational objectives. It would be far more analytical and digested than standard computerized information systems. All persons making proposals to NIE in a major problem area covered by the compendium would be expected to relate their proposals to the compendium (criticizing inadequacies in the compendium if they wish) and at the conclusion of the project to prepare a proposed amendment to the compendium incorporating the results obtained.

c. Program Description. Overall responsibility for this continuing analysis would lie with NIE but it would involve a range of persons, including: NIE planners, program managers, and intramural researchers; visiting fellows and other consultants; grantees and contractors, including Educational Resources Information Center (ERIC), on the basis of unsolicited and solicited proposals; persons from other Federal agencies concerned with educational R&D. The compendium would presumably be made generally available, perhaps in several forms such as loose leaf and microfiche with periodic amendments and printed monographs in various areas of relatively wide interest. It might well be an important element in the regular and continuing education of educational researchers and other persons concerned with education. It should certainly have a strong influence on the intramural and extramural R&D programs of NIE and other agencies concerned with educational R&D. A "popular" version might be produced from time to time to serve as a handbook for educational administrators and laymen with substantive interest in education.

d. Actions. The preparation of NIE program planning documents is a first step in the direction of the more comprehensive system proposed here. Also closely related is the question of the intramural research program, particularly the possible activities of visiting fellows. The next step might be a meeting of some of the persons inside and outside the Planning Unit who have worked on NIE program plans to prepare recommendations for going from the planning documents and procedures to a system of the sort described here. The recommendations could then be sent to selected members of disciplinary study groups, educational leaders, R&D administrators from Federal agencies, and other persons for comment. These comments might lead to a meeting to discuss a revised and expanded version of the recommendations and to suggest next steps.

A capable person with a broad view of educational R&D should be put in charge of the development of this system. A one-week meeting during the summer of persons from various disciplines to establish the dimensions, prepare sample entries, and suggest suitable persons for continuing the work would be very useful. Participants could constitute an advisory committee for the continuing development of the compendium. In addition to the intramural research component, costs are anticipated at \$500,000 for the original compendium and \$100,000 per year for subsequent updating.

The five suggested program initiatives are part of an R&D agenda for reaching NIE subgoals in improving education for the disadvantaged. In addition, several programs suggested in the two other areas are of particular relevance to this area: IV-2 (Early Exit Experiment); VI-1 (Evaluation); and VI-3 (Choice and Decision Making). For all three of these program areas, it is suggested that the first series of projects to be supported focus on disadvantaged populations. Several other programs are specifically applicable to this area which should be considered for inclusion. These are briefly noted below, together with an indication of what subgoals are being addressed by specific program suggestions:

1. Programs to Promote a More Authentic Understanding of the Poor Child.

Anthropological/Sociological studies of teachers, schools, and communities (Program 4).

Compilation and analysis of knowledge concerning failure of education system with the poor (Program 5).

Multi-agency effort in early childhood (See Kooi, 1972)—to be coordinated with the Interagency Committee on Early Learning (OCD, OE, NIH, NICHD, NIMH, OMB).

Incremental compensatory programs—which, in contrast to program V-2, focus on small gains sustained over a number of years. Thus, if a child one year behind in reading in second grade makes average plus two months progress each year through CAI drill and practice, he will be at grade level by sixth grade. The suggestion is based on the fact that dramatic gains often are not sustained and represents an alternative approach to remediation.

Longitudinal studies—already suggested in the

quality area. A substantial need exists for research which follows disadvantaged children over an extended period of time to permit study of the changes which occur in various instructional approaches. Follow up of Head Start and Follow Through children could provide an excellent source of longitudinal data.

2. Programs to Promote Understanding and Needed Change of Schooling and Other Institutions.

Multi-disciplinary design of alternative educational programs (Program 1).

Developing educational elements (Program 2).

Multi-disciplinary problem-oriented courses for adolescents (Program 3).

Anthropological/Sociological Studies of teachers, schools, and communities (Program 4).

Compilation and analysis of knowledge concerning failure of education system with the poor (Program 5).

Projects which challenge education's fundamental assumptions—Many assumptions which are made in the education of young children are so taken for granted that they are seldom challenged. Special encouragement should be given researchers who are willing to seek out, define, and challenge any assumptions traditionally accepted or considered inviolate. Among these assumptions might be "school is preparation for life," "curricula can be pre-planned," "adults should teach children," "children should be taught in groups," and "the purpose of the school is to transmit the wisdom of the past."

3. Programs to Adapt Educational Practice to Home, Community, and Peer Interactions.

Multi-disciplinary design of alternative educational programs (Program 1).

Anthropological/Sociological Studies of

teachers, schools, and communities (Program 4).

Research on specific aspects of relationship of school to community—Some of the important issues to be examined are (a) how decision-making power can be shared (See also program VI-3); (b) how poor parents can become prepared both to support and to question their schools; (c) how parents and other family members can become more actively engaged in the teaching-learning process; (d) what the impact of increased parent involvement is on the school, on the parents, and on the children; (e) how the community involvement process and its impact can be studied more effectively.

4. Programs to Promote a Positive Response to Increasing Awareness of Social and Educational Deficiencies.

Multi-disciplinary design of alternative educational programs (Program 1).

Multi-disciplinary problem-oriented courses for adolescents (Program 3).

As this listing shows, each subgoal is addressed by at least two of the suggested programs, and nearly every program addresses more than one subgoal. In addition, the programs also address the major end and means goals, from academic skills (e.g., Program 2) to social and personal development (e.g., Program 3), and from equality (e.g., Program 1) to responsiveness and coordination (e.g., Program 4).

At least one additional issue must be faced, particularly in this priority area—the disparity between what researchers and developers have learned and put into successful practice, and what practitioners and communities will accept. NIE must struggle with this issue in terms of research and dissemination strategies, for it may be the single most important problem to be met in improving education for the disadvantaged.

VI. IMPROVING RESOURCE USE IN EDUCATION

In one sense, the two preceding chapters implicitly concern ways of improving resource use in education: to reach the goals established for improving quality and education for the disadvantaged will necessitate

reallocation of available resources. But there are endemic problems in this area which deserve specific attention in their own right: internal efficiency, external efficiency, and distributional equity.

As has been documented, in an important sense the productivity of U. S. education has been declining. More inputs than before are now required to "produce" a student-year of schooling. This decrease in productivity combines with rising input costs to result in rapidly rising costs per student per year. It is thus of critical importance to ascertain whether more efficient and productive ways of producing education exist and, if so, to devise methods for developing and implementing them. This is the problem of *internal efficiency*.

Even if the educational system were producing its present mix of outputs at minimum cost, that mix of outputs might be ill-serving the needs—economic and otherwise—of society. The term *external efficiency* describes the adequacy of the mix of outputs produced. In the standard paradigm for a market economy, consumer sovereignty determines the appropriate mix of outputs in the private sector; if consumers dislike a product, then firms are unable to sell much of it and respond by producing less. In contrast, the output mix of the school and higher education system is bureaucratically and legislatively determined. Therefore, ways are needed of measuring the benefits accruing to the individual and to society from each of the various outputs of the system. A better understanding of those benefits would make decision-makers more capable of choosing an efficient mix of outputs to be required of schools and universities. This knowledge would not only improve resource allocation across types of education and improve the responsiveness of the whole system, but also would assist in a rational determination of how much should be spent in total.

Since education is predominantly a publicly financed activity, it is essential to examine the *distributional equity* of the present mechanism and the alternatives for financing education and distributing its benefits. Who pays for education, and how much? Who receives education, and of what quality? Clearly these questions—particularly the second one—overlap strongly with the issues examined in Chapter V and have impact on the process goals noted in Chapter II of equality and access. They are questions demanding searching economic as well as pedagogical analysis.

A. Internal Efficiency and Productivity

This section reviews the basic concepts of internal efficiency and productivity, presents statistical evidence on the sources of the basic problem in this area—that of rapidly rising unit costs—and summarizes present

knowledge with respect to possibilities for improving internal efficiency and productivity, including discussions of the educational production function; the effectiveness of educational technology; and the decision-making, information and reward structures of schools.

1. Definition of Basic Concepts.

a. Efficiency. Output function is the mathematical representation of the process by which inputs are used to attain outputs. If the educational output of a school system or institution of higher education could be produced using less costly input, then the school system or institution is internally inefficient. If no input vector is less costly than the one in use, the system or institution is internally efficient. Efficient input combinations will depend on the price of each factor input; thus, marked changes in relative input prices (e.g., teacher salaries relative to costs of television receivers over 1952-72) that are unaccompanied by corresponding changes in input mix are likely to lead to internal inefficiency. In order to assess the degree of internal efficiency of a school or university system, and to make concrete recommendations for improving it, one must have a (perhaps inexplicit) idea of what the educational function is like; i.e., one must have an empirically useful theory of the conditions that engender learning.

b. Productivity. Productivity, like efficiency, is related to the amount of output one gets from inputs to a production process (See Nadiri, 1970). It is represented by the ratio of output to the sum of weighted inputs. The assignment of weighting factors (usually taken to be the prices of inputs) is a troublesome problem in education; for instance, how many square feet of classroom space constitutes the same amount of real input as one teacher? Even if weights are assigned, relative prices differ at different times or in different places, making comparisons of productivity difficult. (For more rigorous definitions, see Appendix D).

2. Rising Unit Costs.

In most of the economy, increasing productivity over time has allowed factor inputs (particularly labor) to receive increasing remuneration without causing corresponding increases in output prices. In the educational sector, on the other hand, productivity has remained stagnant or even declined, while input costs

have gone up at least as fast as in the economy as a whole. The combination of these two factors leads to the basic problem: Can the rapid increases in unit costs be slowed or stopped and, if so, by what means?

a. Baumol's Theory: Baumol (1967) argues that these cost increases cannot be slowed:

If productivity growth per man hour rises cumulatively in one sector relative to its rate of growth elsewhere in the economy, while wages rise commensurately in all areas, then relative costs in the non-progressive sectors must inevitably rise, *and these costs will rise cumulatively and without limit*. For while in the progressive sector productivity increases will serve as an offset to rising wages, this offset must be smaller in the non-progressive sectors. . . . Thus, the very progress of the technologically progressive sectors inevitably adds to the costs of the technologically unchanging sectors of the economy, unless somehow the labor markets in these areas can be sealed off and wages held absolutely constant, a most unlikely possibility (pp. 419-420).

Baumol then explicitly applies his theory to education:

. . . [the model] suggests that, as productivity in the remainder of the economy continues to increase, costs of running the educational organizations will mount correspondingly, so that whatever the magnitude of the funds they need today, we can be reasonably certain that they will require more tomorrow, and even more on the day after that (p. 421).

The data on input costs and productivity lend support to Baumol's belief in the applicability of his model to education; however, the elasticity of substitution between capital and labor in producing education may be much higher than he supposes. A short-run conclusion would be that internal efficiency and hence productivity in education could be considerably improved by switching to a less labor-intensive form of production. A longer-run conclusion would be that once production of education becomes more capital-intensive, continuing improvements in the productivity of capital will make an impact on education. Thus, developing educational technology and demonstrating uses for it to improve productivity should play a central role in R&D efforts.

b. Empirical Data. The annual rate of growth of output of the U. S. private economy as a

whole was 2.8% during 1919-1948 and rose to 4.0% in 1948-1966. Some of this output increase was due to increases in capital and labor inputs, but much of it was due to increases in total factor productivity which increased at a rate of about 2.1% per annum averaged over the entire period (See Nadiri, 1970; Jorgensen and Griliches, 1967).

In a recent study, O'Neill (1971) finds a productivity decrease of .1% to .3% per annum (depending on output measure) for universities and colleges in the period 1930-1967, though there was some variation across time and between public and private schools (See also Woodhall and Blaug, 1965, 1967). Elementary and secondary schools are also likely to have declined in productivity due to the decreasing student-teacher ratio (from 27.0 in 1957 to 22.5 in 1970). Thus, in contrast to large and sustained productivity increases in the private economy, the educational sector seems actually to be registering productivity decreases.

While productivity has been stagnant, input costs have been rising as can be seen from Table 3. More detailed information on education costs may be found in Appendix A.

Teacher salaries have a steady inflation-adjusted increase, even relative to other salaries, and these form the bulk of school costs; the increase is 41.7% from 1957 to 1969. In higher education, faculty annual salary gains between 1960 and 1967 averaged 5.8% compared with 4% for increases in all industries. Construction costs per classroom have increased much less, with much of the increase occurring very recently.

Increasing costs have affected large city school districts even more than these figures would indicate. For example, New York City Public School Chancellor Harvey Scribner, in requesting a budget increase of about \$500 million (for a total of \$2 billion) for the 1972-73 school year, claimed that \$358.6 million were required ". . . to meet mandatory and inescapable increases in costs" (*New York Times*, December 9, 1971).

These increases in input costs combine with stagnant or decreasing productivity to yield rapidly rising output costs. Changes in output cost over the last 40 years are summarized in Table 4.

The inevitability of these rises depends on the ease with which educational technology can be substituted for teachers in the school production process, i.e., it

TABLE 3: RECENT TRENDS IN ELEMENTARY AND SECONDARY
SCHOOL INPUT COSTS

(1) Year	(2) Average Salary of Classroom Teacher	(3) (2) as a Percentage of Earnings of Full Time Employees in All Industries	(4) Estimated Construction Cost per Classroom
1957-1958	\$6,041	106.9%	\$76,400
1961-1962	6,928	111.9%	66,000
1965-1966	7,670	111.1%	73,400
1969-1970	8,560	117.6%	80,200

Source: *Standard Education Almanac* (1971).

TABLE 4: TOTAL AND CURRENT EXPENDITURES PER PUPIL
IN ADA IN U.S. PUBLIC ELEMENTARY AND SECONDARY SCHOOLS
SELECTED YEARS

School Year	Costs			
	Unadjusted Dollars		Adjusted Dollars (1969-70 Purchasing Power)	
	Total	Current	Total	Current
1929-1930	108	87	238	192
1949-1950	259	209	413	333
1967-1968	786	658	872	730
1969-1970	926	783	926	783

Source: *Standard Education Almanac* (1971).

depends on properties of the educational production function. It depends as well on the information available to schools and how they use it to make decisions. These areas are surveyed below.

3. School Efficiency

Improving school efficiency depends both on obtaining improved knowledge of how school inputs relate to outputs and on having an appropriate information, reward, and decision-making procedure in the schools.

a. School Production Functions. Various individuals and groups have attempted to relate a student's achievement in school to various attributes of his school and to characteristics of his background. The most prominent of these studies was the Coleman Report (1966), and most of the subsequent studies used the basic data collected for this report. Guthrie (1970) reviews 19 of these studies, and Katzman (1971) reviews 12; Appendix E provides a more up-to-date tabulation of the various studies in this area.

While the Coleman Report argues that what happens in schools has a small impact on achievement compared to the out-of-school determinants (e.g., educational level of parents), Guthrie concludes otherwise by pointing to a number of school characteristics that are found by at least some of the studies to be significantly correlated with student performance. In many (though not all) of these studies the correlation does not indicate causality since there tends to be a high correlation between student SES and school input quality. A more significant shortcoming of all studies was pointed out by Bowles and Levin (1968) with respect to the Coleman Report:

The findings of the Report are particularly inappropriate for assessing the likely effects of radical changes in the level and compositions of resources devoted to schooling because the range of variation in most school inputs in this sample is much more limited than the range of policy measures currently under discussion.

These comments are equally applicable to the more recent analyses of the Coleman data collected by Mosteller and Moynihan (1972).

Even given the lack of information in these studies about a broader range of alternatives, it is possible to conclude that inefficiencies exist with respect to existing inputs. One of the most consistent findings is that perhaps the most important school input is (or is highly correlated with) the teacher's verbal intelligence—and the scarcity of this resource is in no way reflected in teacher salary schedules. Thus, Hanushek (1970) concludes his analysis of the determinants of scholastic achievements by claiming that

the present set of hiring practices leads to an inefficient allocation of resources. The analysis indicates that teaching experience and graduate education for teachers do not contribute to gains in student achievement scores. Moreover, the characteristics that do matter are not highly correlated with those factors. Yet these attributes are being purchased by the school district (p. 288).

In higher education, an interesting series of questions arises from the fact that lower division courses cost less than upper division courses, which in turn are less expensive than graduate courses (See O'Neill, 1971). Similarly, there is a wide range of costs among fields, with the laboratory and health sciences typically more expensive than humanities courses. There is little information available to allow the conclusion that the value added in the more expensive offerings is commensurate with the added costs. Another set of output questions has to do with what the more expensive institutions produce compared to the less expensive ones. On straight academic measures (the Graduate Record Examinations), Astin, in current longitudinal studies, is confirming his earlier findings (Astin, 1968) of little correlation between quality indexes of schools (student/faculty ratios, size of libraries, costs/student, etc.) and performance of students, with student ability the dominant indicator.

b. Educational Technology. Unfortunately, there are few if any educational production function studies that include usage of technological inputs (But see Jamison, Welchel, and Wells, forthcoming), since the use of educational technology has focused on improving quality rather than efficiency. Nonetheless, a good deal is known about the performance of educational technologies; five alternatives are described below.

1) There is wide experience with educational TV. However, as with team teaching and open classrooms, the use of TV has not generally been concerned with the problem of productivity, that is, the reduction of costs by selectively substituting for teachers and changing the student-teacher ratio. A variety of possibilities seems feasible. If, for example, in an elementary school the students are watching educational TV programs under supervision of a teacher or a paraprofessional in groups of 40 or 50 students, for at least an hour a day, then this would lead to a significant increase in productivity if the costs are reasonable and the medium is instructionally effective. Chu and Schramm (1968) have thoroughly reviewed the literature on the instructional effectiveness of television (and other media) and conclude that it can teach most subjects at all grade levels about as well as a well-trained classroom teacher. Schramm, Coombs, Kahnert and Lyle (1967) estimate the cost of ETV to be on the order of \$3.00 per student for an hour of instruction daily for an academic year; these costs are, however, quite sensitive to several factors, particularly the number of students utilizing the program.

2) Radio and audio cassette technology could also be used to increase productivity. (For educational flexibility, it may very well be that audio cassettes would be preferable to radio.) They should not be simply a supplement but rather a substitution for regular teaching. In developing countries, radio is practical. In the United States, in view of the widespread use of TV, it is not so clear that radio or audio cassettes will be as politically or socially acceptable, but they are promising media for individualized instruction. Again, a paraprofessional or older student would be supervising far more than 27 students for the periods of learning from audio cassettes or radio. Schramm, *et al*, estimate the cost of radio to be 20% or less of the cost of television (exclusive of supervision), and there is considerable evidence that it can teach about as well (See Chu and Schramm, 1968; Forsythe, 1970).

3) Another feasible technology for teacher substitution is direct on-line computer-assisted instruction. In this case, a wide variety of subjects could be taught. It seems

especially feasible to use computer-assisted instruction to replace teachers at the secondary school level, though rearrangement of student-teacher ratio will also be possible by using computers for instructional purposes at the elementary-school level (See Suppes and Morningstar, 1969, 1970; Jamison, Fletcher, Suppes, and Atkinson, 1971; Jamison and Ball, 1972; Bitzer and Alpert, 1970). In this case, the work in computers should probably emphasize instruction in the basic skills of reading, elementary mathematics and elementary language usage (See Chapter IV, Appendices B and F).

4) A less expensive but also less powerful use of computers is computer-managed instruction. Here the role of the computer is to prepare individualized lessons for students and to guide them through the curriculum. Again the use of CMI should enable the student-teacher ratio to be increased. In both of these uses of computers, emphasis should be placed upon changing the student-teacher ratio, not in outright elimination of teachers for given courses.

5) A fifth technological alternative would involve heavy reliance on the oldest educational technology—that of printing. Printed programmed texts could be much more extensively used than they are at present, and the resulting cost savings would be very substantial if students in large groups were supervised by paraprofessionals. A number of years ago, Schramm (1964) reviewed the literature on programmed instruction and concluded that it can teach effectively. Much work in the development of programmed texts has been done since the time of Schramm's review, and one of the relatively few successful program contractors—in Gary, Indiana—relies heavily on programmed texts.

There are some more radical technological alternatives that should also be investigated. At the college level, off-campus teaching via television, video cassettes, and on-line computers could rather drastically change cost factors in the coming decade. A worthwhile experiment would be the creation of a community college that has only a very small campus and invests its capital in equipment rather than physical plant. Teaching would be conducted mainly in the home or in small decentralized and infrequent groupings of

students. The economic implications of Britain's attempts along these lines at the open university are discussed by Wagner (1971). Germany, Japan, Poland, and Mexico have also had very satisfactory experiences at this and other levels of education.

Another possibility is the creation of mini-schools to replace large high schools, with a view to technological substitutes for the administrative burden of large high schools. Conceivably, with the use of video cassettes and a small, powerful, on-site computer, mini-schools could operate with much smaller overhead, maintenance, and administrative costs on a per-student basis than present ones.

c. Decision-Making, Information, and Reward Structures. Acquiring scientific knowledge about the relation between inputs and outputs in education is clearly insufficient for effecting productivity increases. Individuals responsible for decisions concerning the allocation of educational resources must have the relevant information and must have the incentive to use it. Chapter II, D discussed some of the decision-making processes in the educational system and the influences to which they are subject. In this subsection, the problems of reward and information are briefly discussed.

Any information system for use in the schools must be designed to meet the needs of a variety of groups: students and their counselors, teachers, parents, local and district administrators, researchers, and taxpayers. These groups require different sorts of information, and from different sources, and it is therefore important to develop a multilayered information system. The Rand Corporation undertook an analysis of this problem with the results reported in Coleman and Karweit (1970), but as yet there has been no attempt to move from theoretical analysis to implementing and evaluating such systems.

In order to have information put to adequate use, the education industry's rewards and incentives should be structured in ways that encourage individuals to perform effectively. Financial rewards are perhaps most important, but working conditions and times also play a critical role. The present teacher salary schedule, as previously indicated, rewards college credits and experience to the exclusion of other things, leading to the sorts of inefficiencies described by Hanushek. The system encourages good teachers to move from the

classroom or central city to higher paying administrative positions or the easier teaching conditions of the suburbs. Teacher attrition rates cited in Chapter IV, C are an indication of unsatisfactory working conditions. There is, however, little understanding of present decision and reward structures in educational systems and, therefore, a very uncertain basis for experimentation with alternatives and their evaluation.

In higher education, the professionalization of the faculty, their identification with the disciplines rather than the institution, and a reward system valuing functions that can be assessed objectively (caliber and amount of research) more highly than those that cannot (good teaching) all act as constraints on educational productivity, though they may enhance other outputs of universities.

B. External Efficiency

It is difficult to be as precise about the meaning of external efficiency as internal efficiency because of the lack of an unambiguous social valuing mechanism to assign weights to the differing outputs of the educational system. There is, nonetheless, an extensive empirical literature on the benefits of education. An understanding of this area is necessary before resource use can be improved so as to match outputs more closely to consumer needs and demands.

1. Problems of External Efficiency

Benson, *et al.*, summarize the basic problems in this area as follows:

[external efficiency] concerns the closeness of fit between the outputs supplied by the schools and those demanded by the consumers of educational outputs. In any market or non-market situation, the consumer can exert an influence on the goods and services he receives only through some sort of participation. In the market place, this participation takes the form of cash which is exchanged for private goods. In the non-market economy, this participation takes the form of voting, court action, or volunteer parent participant groups (1971, p. 2).

That the mechanisms for decision-making within the system are inadequate has already been documented by noting the growth of alternative schools, migration to

the suburbs (or paying for private education), student drop-out rates, and such privatizing schemes as performance contracting and voucher systems.

Relationships between outputs actually produced by institutions of higher education and those desired by individuals going through them or by society (e.g., the needs of the labor market) are also tenuous. Studies of overall impact of college show little correlation of grades with later success in business and other aspects of post-college life. Only in preparation of undergraduates for graduate study and research does there seem a matching of what is produced and what is desired, but even this success is thrown in question by the apparent current overproduction of highly specialized Ph.D's who are having difficulty finding employment in their specialty. There are at least two impediments to improving external efficiency.

a. Lack of Information. Notes Benson,

the lack of good information is a deterrent to parental interest as well as to the quality of their participation. That parents lack information about school objectives, outputs, and performance is not surprising. School administrators and teachers in general lack this information, too. Indeed the kind of information required for parental participation is also needed in order to assess the internal efficiency of a school (1971, p. 9).

The situation is no different for institutions of higher education. Little guidance is available that allows informed choice. A survey of college alumni by Spaeth and Greely (1970) found that the greatest number of suggestions for reform of higher education asked that institutions provide the kind of education promised in their catalogs, a severe indictment of the relevance of information to subsequent experience. Beyond the lack of information of use to immediate client groups lie the even more stubborn problems already touched on of goal definition, output assessment, and lack of knowledge about the contribution of educational outputs to private and social gain and satisfaction.

b. Unresponsiveness of Systems and Institutions. The inability of large institutions to satisfy all constituents, as manifested by the disenchantment of minorities, culturally deviant groups, and more recent aspirants to education, has been documented earlier. This unresponsiveness is a reflection of the extreme

difficulty of serving many different constituencies, of shifting goals and raised expectations, and of the nature of bureaucracies needed to govern such complex entities as city school systems or multiversities.

The purpose of research and development in the area of external efficiency is, then, to improve the information about benefits of education of different types in order to improve the quality of decisions to be made by students, their parents, school and university bureaucracies, and by society at large.

2. Existing Knowledge

The benefits of education can be assigned to three classes: (1) present consumption, (2) future consumption, and (3) investment. Thus, education can increase (or decrease) an individual's enjoyment of life, his use of leisure time, satisfaction from social activities, etc., at present (type 1) or in the future (type 2). Type (3) is usually seen from the point of view of increasing an individual's capabilities as a producer which can yield him benefits on the market in terms of income or occupational choice. These benefits of education do not necessarily accrue only to the individual who is being educated; they also can affect his friends, present family, future family, and society at large. Such benefits or costs not directly captured or incurred by the individual often form the subject of collective policy decisions (i.e., government decisions).

a. Private Benefits. Benefits accruing directly to the individual include: direct returns such as income, occupation, and status; option returns whereby an added quantity of school buys the option of going on to the next level with its associated benefits; and non-market returns to the individual which do not yield direct monetary reward in the market.

1) Direct Returns. One function of schooling is to increase the future productive capabilities of the individual. The mean income data drawn from the 1960 census in Table A-8 indicate that increased schooling is indeed associated with increased income. Figure A-4 makes the point in a stronger fashion by exhibiting age-earnings profiles by level of education. Two apparent aspects of the profiles are of interest: (1) the higher the level of education, the steeper the rise in earnings through the early work years and usually the higher the starting salary, and (2) the

higher the level of education, the higher the retirement earnings. Many studies have attempted to clarify those correlations, some dealing purely with the benefit side, others adding costs as a consideration.

There are numerous problems in delineating the relationship between education and future success, however measured. Foremost is that education is not the only variable one would expect to have a significant effect on future employment and income: natural ability, motivation, socio-economic background and personal connections are also important, just as they are in schooling itself. Adding to the empirical problems is that there is no clear definition of what is meant by education: years of schooling, school achievement, educational expenditures, or other criteria. Denison (1962), in a classic study, used the quantity of schooling as a measure and made a rather arbitrary ability adjustment by assuming that differences in schooling accounted for 60% of the differences in income and other factors explained the rest. There has been much debate over the appropriateness of this assumption, with Griliches (1970) and Griliches and Mason (1971) showing years of education to be much more significant than years of schooling (Hansen, Weisbrod, and Scanlon, 1970; Becker, 1964; Weisbrod and Karpoff, 1968). Quality (rather than quantity) of schooling as measured by expenditures or by achievement has also been found to be significant (See Weiss, 1970; Daniere and Mechling, 1970; Morgan and Sirageldon, 1968; Welch, 1970; Johnson and Stafford, 1970). Gintis (1971) forcefully advances the thesis that it is the non-cognitive outputs of schooling that are most important to future success, especially the development of personality characteristics that enable the individual to fit into a bureaucratic and hierarchical work environment.

Another group of studies in this same area deals with costs of education, as well as benefits derived. Most of these are rate-of-return analyses and come to the conclusion that education appears a worthwhile investment. For instance, Schultz (1970) estimates private returns of 35% and higher to elementary school, about 25% to high school, about 15% to college and about 15% to graduate instruction. These are not undisputed, but even Rogers (1969), who finds lower returns,

concludes that generally they appear favorable to or at least comparable with returns on physical capital. Most studies use measures of the quantity of schooling, though a few have attempted to examine returns to quality, with all the problems discussed above.

There is also strong evidence for relationships between education, however measured, and occupation, status, and prestige. The controversy as to what aspects of education most influence economic and occupational success is far from decided, and thus policy conclusions for the individual or society in this area are unclear. While on the average education does seem to make a difference, a number of studies show that certain population groups, such as blacks and other racial minorities, regional groups, and women, receive much lower benefits from education than white males (See Sexton, 1961; Michelson, 1969; Blum and Coleman, 1970; Hansen, Weisbrod and Scanlon, 1970; St. John, 1970; Weiss, 1970; Hanoch, 1967; and Psacharopoulos, 1972; also Tables A-11 and A-12). Further, the results are not very helpful to an individual trying to decide whether or not to invest in any given level of schooling, since most of the evidence is based on averages for some age or educational level group. Marginal rates of return are useful indicators for the group as a whole, but for the individual there is considerable variance about the mean, and the worth of additional education for him will depend heavily on other characteristics of his situation.

2) Option Returns. By completing an additional amount of education an individual receives the option of entering at the next higher level. The option concept can also be thought of in relation to the expanded choices the individual receives from added education. This can be considered a benefit whether or not it is translated into higher income. Weisbrod (1962) has estimated that such widening of options could raise the rate of return by 10%.

3) Non-market Returns. The consumption benefits of education mentioned earlier fall into this category of returns: increased enjoyment of leisure time and life in general. There are also some more specific non-market returns, such as a better ability to manage household

economics, mortgage or other payments, checking accounts, informed consumer choice. These benefits are not inconsiderable; Weisbrod (1962) has calculated the monetary value of an increasing number of taxpayers being sufficiently literate to prepare their own income tax returns at \$250 million for 1956—3% of the costs of elementary schooling. This type of benefit has obvious societal as well as private aspects.

b. Social Benefits. There are two general areas of social benefits: those that accrue to the economy as a whole, and those that are more oriented to non-economic effects.

Growth in the Gross National Product (GNP) is considered of social value in most nations today. Denison (1962) and Schultz (1970) have explored the relationship between education and GNP. Denison calculated the change in GNP due to changes in the quality of the labor force over time. For the 1929-1957 period, he found that education, through improving the quality of the work force, contributed on the average .68% per year to annual growth, i.e., education accounted for some 23% of annual GNP growth, later corrected to 18-19% by Bowman (1964). Schultz, by a quite different method, came up with a similar estimate of 17%-20%. Denison projected a slightly smaller contribution for education to growth in the 1960-1980 period and concluded that in the long run this contribution through increases in the *amount* of schooling will be impossible to maintain. Other investigators have estimated education's contribution to growth as low as 10%.

A fundamental objection to such work is the reliance on earnings or income as a measure of productivity. Berg (1970) re-advances the hypothesis that the main function of the educational system is to give certificates which employers then use to hire, making many employees over-qualified for their task. Therefore their income overstates their productivity to society, and any results based on education differentials overstates the case of the social benefits due to education. Carnoy (1972) argues that discrimination by sex and race (See Tables A-11 and A-12) in wages and occupations may make both income and productivity poor measures of social value. Griliches (1970) has looked at worker productivity in manufacturing and agriculture, based on cross-sectional and longitudinal data. Results indicate that education is a significant variable in accounting for growth in output measured. He computed that schooling per man accounted for 23%

of the rate of growth of national income due to manufacturing for 1947-1960—more than double the contribution from increased labor hours.

Most of the studies discussed earlier in this section on private rates of return have also looked at social rates of return. Social benefit analyses, unlike private return studies, include public finance costs of public education. Estimates of social returns are generally lower than corresponding private returns because the former uses much greater cost figures. Psacharopoulos (forthcoming) reports U.S. social returns for 1959 of 17.8% to primary, 14.0% to secondary and 9.7% to higher education. Johnson and Stafford (1970) have tried to look at the quality-quantity of education distinction from the point of view of social returns and concluded that there are "clear benefits to reallocating resources in favor of school quality and away from years of schooling."

It is not clear that consideration of social benefits has always entered educational growth and planning, though the Morrill Land Grant Act of 1862 and, more recently, the growth of community colleges can be taken as evidence of explicit expectations of social return from educational investment. The planning of education for developing countries has been a much more deliberate process in terms of projected economic benefits, as is also true for planned economies such as that of the USSR. In both cases, serious mismatches indicate the extreme difficulties of such planning. The educational system is, however, expected to produce the manpower required by the nation. Attempts at manpower forecasting are not very useful sources of information for the educational system or its clients; since requirements are set without regard to costs, forecasts often fail to allow for a potentially high elasticity of substitution among laborers of varying skill categories and—most important for education—there is the difficulty of doing long-term sectoral forecasting at a useful level of disaggregation. A forthcoming collection of case studies of the use of manpower planning by Ahamad, Blaug, *et al.* (1972) concludes that the models have only been useful for short-term labor demand forecasting and are close to useless as presently constituted for long-term educational planning.

Numerous studies have linked education to health and crime but only Levin (U. S. Senate Report) has attempted to quantify the returns to education in these areas. Another important benefit of education is usually held to be the better functioning of a democracy. Several studies have indicated that educational attainment is very much related to political participation

(See Table A-13), but again the magnitude of this benefit is difficult to quantify. Studies by Bowles (1969) and Bowman and Myers (1967) indicate education is also positively related to the ability and willingness to migrate, an economic benefit in that it helps labor be mobile and thus reduce unemployment and underemployment. The need for mobility is documented by the differences among states and anticipated gross shifts in growth rates of employment. Whereas in Nevada this rate was as high as 70% and less than 10% in Missouri for the 60's, in the 70's Nevada is expected to move from first place to 47th, Hawaii from 17th to 46th, and the District of Columbia from 51st to 24th (U. S. Department of Labor, 1970).

c. Conclusions. The preceding overview of the private and social benefits of education has concentrated to a great extent on economic benefits. An important picture that emerges, though, is that much of the work is not particularly relevant to decision-making, and even the important exception, manpower planning, seems to have contributed little of value. Hence, high priority for improving external efficiency is the development and availability of information that would be useful in decision-making at all levels—by clients (parents or students); educational administrators in schools, colleges, and graduate schools; communities; school boards and boards of trustees; local and state governments; courts and the legislative and executive branches of the Federal Government.

C. Distributional Equity

In 1970-71, expenditures for public elementary and secondary schools reached approximately \$44.4 billion and public expenditures on higher education reached a level of \$15 billion. As noted in Table A-1 and Figure A-1, education is the largest public sector activity after defense. It is thus a matter of considerable social importance to understand clearly which groups pay for, and which groups receive, the benefits of this public enterprise. Questions concerning who pays and how much relate to the basic area of school finance; questions concerning who benefits relate to the problem of equality of educational opportunity.

In one sense the issues of finance and equality of opportunity constitute an aspect of the study of the net social benefits of education, and could have been included in the previous subsection on external efficiency. The essentially distributional nature of these benefits, however, and their presently perceived importance justify considering them separately.

1. School Finance

The present system of school finance faces three somewhat related sets of problems. Table A-17 illustrates the first problem documented earlier: expenditures in the educational sector are rapidly increasing. The second problem has also been noted: the public now shows a decreased willingness to provide the resources for schools; Table A-14 reflects the increasing incidence of rejection of school bond issues in local elections. It is difficult to resolve how much of this rejection is due to dissatisfaction with the efficiency or output of the educational system, and how much is due to dislike of the local property tax. These issues have already been discussed in some detail earlier.

The third major problem in the area of school finance concerns appropriate ways of responding to judicial decisions on the constitutionality of using property taxes to finance schools. The "equal protection" clause of the 14th Amendment to the Constitution is being interpreted to imply that a child is denied equal protection if the quality of schooling he receives (as measured by financial inputs) depends on the wealth of his parents or his neighborhood (See Table A-15 and Greenbaum, 1971). As a result of the *Serrano v. Priest* decision, California seems likely to move toward a "power-equalizing" finance formula that would link per pupil expenditures to a locale's percentage tax rate rather than to total tax revenue. As higher taxation levels are typically required in low-income districts for a given per-pupil expenditure level, the power equalizing approach would make it easier for poor districts to provide more for their students.

The principal alternative to the power-equalizing approach is full state funding with constant expenditures per pupil across districts. A New York State Commission (Fleischmann Commission, 1972) has recommended state funding for that state, modified by supplemental funds for students in the bottom quartile of achievement. For the country as a whole, the President's Commission on School Finance (1972) recommended state funding with the provision that local school districts could supplement their budgets by up to ten percent of the state norm. Incremental costs for various equalization schemes have been estimated to run anywhere from 5 to 20 percent.

The increasing demand for funds, the apparent decreasing willingness to support rising costs, and the uncertain and rapidly changing legal environment relating to financial support for the schools constitute

important policy issues for education. The contributions of research and development in these areas should focus primarily on the illumination of alternative strategies and their impact and political feasibility.

2. Distribution of Benefits

Insofar as education provides the consumption benefits and increased earning power described earlier, it is of considerable importance to ascertain who obtains these benefits. A closely related issue concerns the extent to which society can use a redistribution of the benefits of education to help effect a redistribution of income. Education and poverty are linked by at least a correlational relationship, but the degree of causality is incompletely understood. Thurow (1969), in an econometric study, comes to the conclusion that improvements in education are one of the most effective ways of eliminating poverty. Ribich (1968), however, bringing together all the available evidence on compensatory education in the U. S., concludes that the returns are low and that, on the whole, education is not capable of contributing in any major way to the amelioration of the poverty problem. Milner (1972) comes to much the same conclusion. In the related area of discrimination, most studies indicate that education (or at least education alone) is not going to be able to end the income differentiation documented earlier between blacks and whites. The evidence is far from conclusive at this time, however, and much further work is needed on the relationship between education and poverty.

Aside from the connections between schooling and economic opportunity, there is the question of inequality within the educational system itself. The most easily measurable form of inequality is that of financial inputs, though as pointed out earlier the relationship between these and quality is also far from clear. Michelson (1972) has provided an early statistical analysis of this phenomenon, but his work needs to be extended to many more states and regions. An interesting conclusion of his study is that even though the Federal Government contributes only a small fraction of the resources for public elementary and secondary education, its potential equalizing leverage is quite strong. In his view, at present that leverage is used only to a limited extent of the amount possible.

Even if financial resource inputs are roughly the same across students, the effectiveness of those resources may vary considerably across groups, depending on their needs and characteristics and the many other considerations discussed in Chapter V. It is thus important to obtain a measure of real input inequality as well as of financial input inequality; Coleman (1968) and Michelson (1970) provide approaches to these problems. A thorough understanding of this sort of inequality is closely linked to improved understanding of educational production functions.

One of the most controversial notions of equality of educational opportunity relates to the distribution of educational output, since it impinges on value judgments concerning development of individual talent and diversity versus equality. Assuming such judgments to have been made, there remains the question of how schools should best allocate their resources to improve the distribution of educational output in the face of the many non-school variables affecting educational output. While methodologies are being developed to help schools consider resource allocations other than traditional ones (See Jamison, Fletcher, Suppes, and Atkinson, 1971), inherent inequalities are likely to continue. Carnoy (1972), for instance, undertakes some straightforward but interesting computations that indicate the virtual impossibility of getting close to equal educational output with conceivable levels of traditional school inputs.

The literature on equality of educational opportunity is by now extensive, but any understanding of the causalities and relationships between input and output inequality, and between these and income and social inequality, is only just emerging. Research and development in this area must be a multi-phasic process where:

- a. Ongoing developments such as alternative funding patterns likely to be implemented in response to court decisions serve as a natural laboratory in which the effects of manipulating given variables can be followed;

- b. Specific experiments are carried out, for instance with changes in traditional capital/labor resource allocations or with incentive structures that are carefully delineated in scope and purpose to try out possibilities in action;

c. Studies are conducted not in postponement of action, but in order to illuminate issues and problems and thus enhance understanding of ongoing developments and try out experiments with increased chances of success.

The next section briefly outlines some possibilities in each of these areas.

D. Research and Development Initiatives.

The preceding analysis of resource use in education leads to the conclusion that: (1) the relationships between resource use and educational benefits are not well understood; (2) the contributions of education to private and social gains, particularly causalities, are unclear; and (3) current patterns of distribution of resources and benefits are being questioned. Further, definitions of educational output are narrow, significant variances in resource allocation nearly non-existent, and choices for the consumer or opportunities for decision-making limited. Therefore, programs in this area are built around the development of the information and tools necessary to improve use of resources and experimentation with alternatives. The overall objective is to enhance the process by which education is conducted along all the dimensions listed in Chapter II: equality and access, responsiveness, productivity, and coordination.

1. Multiperspective Analysis of Educational Objectives and Evaluation.

a. Basic Idea. A major continuing effort to develop improved definition and assessment of educational objectives and outcomes from a variety of perspectives: economists, behavioral scientists, educators, students, parents, community and minority groups, natural scientists, engineers, artists, and persons from other occupations and professions. The primary emphasis is on the need to define desirable educational outputs and assess them over a much broader range in order to understand the functioning and benefits conferred by the system. The program will also address quality goals in terms of effects of widely used output measures on educational programs and students; it is also relevant to improving education for the disadvantaged because of the need for better evaluation of programs designed to raise their achievement.

b. Examples. It is commonly agreed by experts and lay critics alike that current tests measure

only narrow cognitive achievement, do not deal with the more complex skills, and completely neglect such goals as ability to deal with people or motivation toward achievement. Therefore, advances in the theory and applications of measurement in the social sciences, as reported in a recently completed two-volume study by Krantz *et al* (1972), should be applied and extended in education. The two areas most in need of development are criterion-referenced achievement measurement and theoretically sound techniques for measurement of affective variables. These two areas were emphasized by the Panel on Assessment and Evaluation convened by the NIE Planning Unit (report to be prepared). Using such improved measures, models must be devised coming to grips with the multi-dimensionality of educational output across cognitive and affective domains, so that educational objectives and the educational production function are not conceived as simply relating inputs to narrow measures of cognitive outputs. The models must also include a dynamic orientation and take into account non-school influences (See Gintis, 1971).

Other examples include: evaluation methodologies that accommodate differing views of educational objectives according to individual, professional, community or social goals; studies designed to investigate the amount of testing necessary to various purposes, uses to which measurements are put, and effects of testing on the individual student and on instruction; development of strategies concerning the types of evaluation and mix of techniques, particularly for assessing experiments in education; some cross-national studies of educational goals in other countries (Western and non-Western), their relationship to the state of social and industrial development, history, etc., and their assessment.

c. Program Description. This effort is aimed at improved definition of educational objectives and assessment of their attainment by broader techniques than presently in use. Definition of what the outputs of education should be will involve very broad-based involvement of different constituencies; assessment of what the outputs actually are will entail applying a range of disciplines in addition to traditional psychometrics to devise improved evaluation methodology. Some of the basic studies will be supported in the context of unsolicited research proposals within the specified areas applicable to this program; some of the development of specific assessment techniques may be advanced by contracting with a variety of expert agencies. It is important that efforts be interdisciplinary. Some of the

research activities within NIE should be devoted to applying the newly developed assessment techniques and strategies to NIE-supported experiments and programs. Eventually, a conceptual framework incorporating educational objectives, input-output causalities, and evaluation strategies should result.

d. Actions. During the NIE planning phase, several steps will be necessary:

1) A series of meetings of evaluation and assessment experts to include participants from testing and measurement as well as from fields using quite different techniques (e.g., case studies, investigative procedures, in-depth process analysis), and psychologists and economists interested in the educational production function;

2) Stimulation of the interest of contractors to develop innovative techniques assessing complex cognitive skills and affective variables;

3) Meetings with representatives of various groups (disciplines, professions, occupations, Black, Chicano, student representatives, educational administrators and policy makers) to arrive at improved definitions of educational objectives and explore problems concerning evaluation;

4) Development of guidelines for the study component of the program, on the basis of interaction with the professional field, to concentrate on particularly crucial research areas.

In the NIE operational phase, solicitation of proposals and negotiation of contracts could begin early in fiscal 1973, provided planning steps are carried out during the summer. Priority emphasis will be on developing improved assessment techniques and models of the educational production function. Development of non-trivial evaluation methodology is costly. The importance of this program to all three NIE priority goals of quality, education for the disadvantaged, and resource use, is reflected in a budget of \$5 million for fiscal 1973.

2. Experimentation in Education Production

a. Basic Idea. This program involves exploration of alternative mixes of educational

technologies used to teach various subject matters at different levels of education. Instructional time of different lengths (course units, school days, terms or semesters, school year) will be tried. Experiments will include both management and communications technologies, i.e., changes in organization and administrative practices as well as in instructional techniques and traditional uses of capital and labor. Each mix to be tested should be designed so that per-student costs (exclusive of development costs) are equal to or less than present national averages.

b. Examples. Some examples are given in Appendix F, such as: technology-based community colleges modeled on the Bavarian Telecollege and the Chicago TV College; and the teaching of basic skills in elementary school via computer-assisted instruction. Management areas to be examined include: experiments with aggregation and disaggregation of institutional subunits and/or functions, described in more detail in Appendix C for higher education; and experiments with a variety of different staffing patterns, including the much more extensive use of students for their own instruction, and that of their peers and younger students.

c. Program Description. Essentially this program would be similar to those on "Purveyors of Instruction" and "Unbundling of Teacher Education" in Chapter IV, but the focus would be on efficiency. Thus, the same or parallel projects would be developed, but with evaluation criteria clearly defined as to the objectives, i.e., whether a project is focused on increasing quality or on increasing internal or external efficiency.

d. Actions. NIE planning and operational phases would be similar to those already described in the parallel "Quality" initiatives, but would in addition include economists and use information derived from production studies (See Program 5 in this Section) in planning, development, and evaluation of projects. Serious experiments with changing organizational patterns and instructional mixes are likely to be expensive; in addition to the budgets for these activities in Chapter IV, \$5 million should be allocated in fiscal 1973 for experiments specifically aimed at productivity.

3. Choice and Decision-Making

a. Basic Idea. To provide, through research and experimentation, greater choice among alternatives

to consumers of education (students, parents, communities) and greater voice in what alternatives will be available. The objective is to increase external efficiency and distributional equity through a better fit with students' needs and learning styles and with societal requirements. The program responds to widely perceived dissatisfactions with current outputs and their distribution, from inner-city communities to suburban neighborhoods.

b. Examples. Increasing choice requires at least two conditions, the existence of alternatives and mechanisms for exercising choices.

1) Alternatives: Planned new experiments and study of those already going on, including: assisting in the design and testing of several alternative voucher plans, some of which would focus on internal efficiency (choice being in terms of competing vendors of similar outputs), some in which choice would be on the content of schooling; taking advantage of naturally arising or already initiated alternative schools (e.g., in the Experimental Schools Program) inside and outside the system and experiments in higher education with sanctioned and nonsanctioned sponsorships (e.g., University-Without-Walls, Washington Free University) to develop systematic analysis of effects; developing new alternatives, an example being the design of schools with specific parameters suggested in Program V-1; such development should be based on knowledge derived from current experiences as well as interdisciplinary expertise and community need.

2) Exercising choices, such as: studies of existing decision-making structures in school systems, parochial and private schools, and institutions of higher education, including effects of current decentralization efforts; monitoring of community school efforts, inside and outside the system, with particular attention to how well their outputs match the objectives of parents and students; studies of short and long-term social effects of separatism and individual group control in education; development, in selected large school districts, of alternative schemes to provide increased opportunity for students and parents to participate in formulating the objectives of the schools; development of multilayered information systems which will give feedback to parents,

teachers, and policy makers on available alternatives and anticipated consequences of specific choices; a model has been developed by Coleman and Karwait (1970) that could be implemented and evaluated.

c. Program Description. This is an area of great sensitivity, since some fundamental assumptions about the nature of public education are at issue. Therefore, in its initial stages, program activities should focus on naturally occurring experimentation and cooperation with other agencies such as OEO, though some suggested new experiments should also be undertaken. In particular, it is necessary to understand under what conditions viable alternatives can be created and sustained (alternative schools outside the system seem to have a half-life of three years or less), and what decision-making mechanisms are sufficiently compatible with social structures to be integrated rather than rejected or rendered ineffective. The assessment of existing experimentation in creating alternatives in schooling and decision-making will be done by contracts; new experiments will have to be designed on a one-by-one basis in close collaboration between imaginative educational innovators in the field and NIE staff.

d. Actions. In the NIE planning phase, existing surveys of alternative schools (Graubard, 1971) will have to be expanded to include within-system alternatives, community schools, and experiments in higher education; contracts will be planned to assess a variety of the alternatives along the lines described, making sure of broad coverage and a range of evaluation techniques; discussions should be initiated for cooperation with other agencies and for beginning design on new experiments; contract negotiations for the development of information systems should be started.

In the NIE operational phase, major contracts will be let for the assessment and understanding of effects of alternatives in schooling, methods of exercising choice, and consequences of specific choices; where appropriate, contract negotiations will include other agencies that support relevant experimentation; after investigation of interested sites, contracts will also be let for cooperative development of information systems by school systems and management and media specialists to permit improved decision-making by clients; design of new experiments will undergo an intensive developmental phase combining the skills of in-house research staff with

external consultants and innovators and staff from other agencies.

Costs in fiscal 1973 are estimated at \$3 million, increasing to \$6 million in fiscal 1974 to allow for starting one or two experiments both in creating alternatives and in decision-making mechanisms.

4. Incentive and Reward Structures

a. Basic Idea. This program is related to Program 3 in choice and decision-making. It is a two-level effort integrating the study of existing incentive and reward structures with the implementation of alternative methods. Study and experimentation should include incentives for teachers, administrators, and students.

b. Examples.

1) Studies of current rewards and incentives in a wide variety of institutions of lower and higher education, public and private, small and large—how they operate and their effects on educational outcomes, institutional behavior, and behavior of individuals in the institutional setting.

2) Better knowledge of the value systems of these individuals and of the institutional milieu in which they operate. For instance, research could illuminate how teachers would trade off working conditions, sabbaticals, salary, teaching loads, and other elements of their job environment.

3) Experiments with alternative reward schemes. For instance, Federal tax deductions for superior teachers in "poverty schools" have been suggested by Schrock, Singell, Yordon *et al* (1971). If such experiments are conducted, they would provide relevant data for measuring the effectiveness of equal dollar expenditures on such alternatives as sabbaticals, teaching loads, or tax credits.

4) Experiments with different credentialing and promotion criteria on which current reward systems are based. The need for such experimentation has been noted in both Chapters IV and V.

5) Although performance contracting has been disappointing in raising student performance, it may be easier to reduce the costs of attaining a given achievement level than it is to increase achievement at the present level of cost. It might therefore be useful to undertake experimentation with a "productivity contract" to private concerns. They would be paid a base amount for an educational task, an amount considerably less than schools now pay. The contractor would be required to repay substantial amounts if students performed less well than past experience at that school would indicate they should; the contractor would receive somewhat more if the students did better. The focus here is on introducing the profit motive and business incentive structures into education.

6) Continued experimentation of the sort OE has recently begun under contract with Education Turnkey Systems, Inc., in which parents, students, and teachers are paid cash bonuses for student progress.

c. Program Description. This program is similar to Program 3 in that it also attempts to build basic knowledge and theory by studying on-going experimentation and mounting some carefully designed and tested new experiments. In this program, however, more emphasis will be needed on the last area, particularly in terms of new alternatives for rewarding teachers and other educational staff. Types of individuals to be involved will include economists, management experts, psychologists and sociologists (for instance, in example 2 above), and assessment specialists. A judicious mix of contracts and solicited proposals will characterize the program, but funds for unanticipated good ideas in the area should be kept available.

d. Actions. Planning and operations will be similar to Program 3, with a wide variety of viewpoints represented in planning, and close cooperation with other agencies developed for such experiments as performance contracting and tax incentive schemes. Estimated costs for fiscal 1973 are \$2 million and could rise to \$5 million if design of experiments proceeds at an appropriate pace in fiscal 1974.

5. Studies in Efficiency and Productivity

a. Basic Idea. In addition to studies specifically relevant to evaluation, experimentation with instructional mix, provision of choice, and reward and incentive structures, basic research is needed in a number of poorly understood areas of efficiency and productivity of education.

b. Examples.

1) Regarding the education production process, the need for improved models reflecting diverse goals and multidimensional assessment of outcomes has already been mentioned in Program VI-1. However, specific theoretical work on integrating the work of psychologists and economists should be carried out quite apart from that program. Psychologists as well as economists have developed quantitative, empirically validated models of the relation between inputs and outputs in the educational process (See Jamison, Lhamon, and Suppes, 1971). While these models seem to have better explanatory powers than those of the economists, this gain is at the cost of very limited scope. Research aimed at bringing together the approaches of psychologists and economists, perhaps by gathering and analyzing data at intermediate levels of aggregation, should further illuminate the production function.

Various studies of productivity trends in education would contribute understanding, but will be limited by progress in measurement and modeling. Areas that should be investigated include historical changes, productivity and efficiency of schools operating for profit (e.g., technical or secretarial schools), and inner city schools operating with normal budgets that show substantial success in educating disadvantaged children (See Weber, 1971).

Studies are needed of the ways in which schools respond to high levels of financial pressures, and concomitant effects on learning. For example, in the 1938-39 school year, the Dayton Public Schools ran out of money and responded by extensive use of radio in the schools; the effects are reported by Atkinson (1942) and remain today an important source of information on effectiveness of instructional radio. School districts are shortening the school year and hiring from the bottom of the

career ladder to keep down staff costs. These responses form natural experiments that researchers should be prepared to examine.

2) Regarding external efficiency, follow-up studies in several institutions of higher education representative of two- and four-year private and public colleges and universities have been suggested by Benson *et al* (1971). From this information, supply and demand schedules could be estimated for individuals of different skills and attending different types of institutions, as could rates of return, income levels, and probability of employment.

Relationships between education and worker productivity; GNP growth; specific health, voting and consumer economics behavior; and drug education and drug use would illuminate those characteristics of each area that are influenced by schooling. One aim of such studies is to relate benefit-oriented research to the decisions of parents and schools.

3) Regarding distributional equality, policy-oriented research is needed on alternative strategies for school finance that would be consistent with the present court decisions. Much detailed information must be acquired about tax incidence and about the redistributive aspects of the various new financing systems being proposed. It will be important to at least attempt to examine the impact of different financial structures on the incentives of schools and teachers to be productive and to meet the demands of their communities.

Research is needed on the extent to which the educational system can affect the distribution of income and, in particular, on the role it might play in the eradication of poverty. This would involve continued research on the relationship between education and worker-productivity, an examination of the ever-increasing level of credentials required for jobs, and an examination of the inverse relation of poverty to education.

Continued statistical analysis should be conducted on the extent of resource inequality in education across regions, economic classes, races, and sexes. These studies should be conducted not only for a number of particular grade levels, but

also in terms of the total amount of education received. Improved measures are needed of inequality, real resource inputs, and the contribution (if any) that the educational system makes to reducing output inequality.

c. Program Description. In the main, this program will operate much like an interdisciplinary research support program, but focused to create a body of knowledge and a conceptual framework for understanding causal relationships in educational efficiency and effectiveness. Particular emphasis should be placed on taking advantage of available and readily obtainable information and data, as discussed by Campbell (1969). Since it is difficult to predict when a particularly interesting event (from the point of view of yielding information) is likely to happen (for instance, when a school district will suddenly run out of money), perhaps some "crisis teams" should be funded to stand

ready to administer tests and gather data on short notice.

d. Actions. Further planning would be minimal, since a number of economists have made good suggestions for needed work and are prepared to proceed in conjunction with psychologists and sociologists. The operational phase would consist of inviting proposals which would be evaluated on the basis of likely success in increasing understanding of the educational production process, and on the quality of persons to be involved. The multidisciplinary research program currently funded by OE/NCERD and such major studies as Project Talent and WICHE provide reasonable prototypes. Costs for such a program could range from modest (less than \$500,000) to considerable (several million) depending on whether extensive longitudinal and retrospective studies using large samples are included.

VII. RESEARCH AND DEVELOPMENT STRATEGIES

The preceding three chapters have identified a number of R&D initiatives appropriate to attaining NIE's goals in the three priority areas derived from an examination of the domain and current problems of education. Before integrating these initiatives into a program plan of new and ongoing activities (including those to be transferred from OE), it is necessary to scrutinize briefly the types, performers, processes, and products of R&D in order to develop a viable strategy for NIE support. The whole question of R&D strategy in any social development area is currently one of intensive investigation and itself subject to research. Campbell (1969) in a seminar paper on "Reforms as Experiments" and in subsequent publications has developed methodologies for R&D in the context of naturally occurring experiments. Because the issues in developing a successful R&D strategy are far from clear, and resolving them is crucial to the success of NIE, both Markley (1972) and Cohen (1972) have prepared separate documents dealing with this topic. Therefore, the issues will be examined only briefly here.

A. Types and Performers

This component is perhaps the one best understood in the whole area of R&D. The Rand Reports

(R-657-HEW, WN 7676 through WN 7680), prepared in connection with planning for NIE, discuss mechanisms for performance and support for fundamental research, practice-oriented research and development, and programmatic research.

Since NIE programs will be made up of components of each of these, it is important in developing viable strategies to understand who the performers of each type are and what support and evaluation mechanisms will attract the most competent grantees and contractors, so that the Federal investment in educational R&D will yield the hoped-for return in improved knowledge and practice and in solving priority problems in education. The question of designing the NIE organization most suited to its tasks is being addressed elsewhere; the point to be made here is that mechanisms established for R&D support and administration within NIE must be sensitive to the performers and mechanisms in the field.

In the past, performers have tended to come from a fairly narrow professionalized base of educational research performed largely in graduate schools and departments of education and tending to concentrate on early levels of education (See Figure A9). In recent

years, OE has sponsored the formation of two different kinds of external agencies, the Regional Education Laboratories and the Education Research and Development Centers which have also had some of their mission directed toward R&D. In the Laboratories, the education profession has been well represented and an effort made to serve appropriate state agencies and the public. Also, the educational programs sponsored by NSF, NIE, NICHD, OERI and other science-oriented agencies have served to attract to educational research scholars from the natural and behavioral sciences.

Two features of the traditional structure deserve note. Very little research on higher education has been done, even though most performers have their professional homes there. What little work there has been in higher education has usually been discipline-centered and guided and has not benefited from interaction with the education profession. A corollary of the separation between education departments and the disciplines is that the traditional liberal arts section has not been sufficiently concerned with education as a field of research. This has deprived the educational system of the fresh viewpoints that involvement of a wide variety of disciplines could bring and has deprived both the liberal arts faculty and their students of knowledge and understanding of a vital area of their society and culture.

If NIE is to make a substantial improvement in the ability of R&D activities to contribute to the substance and processes of education, it must devise strategies both for attracting a broader range of performers (in terms of personal background and professional expertise) and for attracting more performing organizations.

B. Processes

1. Appropriate Models

In the physical sciences an acceptable definition of research is not difficult to generate; it would include the testing of hypotheses and the validation of data, and would rely heavily on the experimental method. In education the process is not so easy. The complexity of the educational endeavor guarantees that a single model of research—even a fairly well articulated one—will not produce the kinds of fundamental change that the experimental model brought in hard science.

The difficulties are several. There is no well articulated rhetoric with which teachers, administrators,

scholars, and policy-makers can communicate. Consequently, it is very difficult to describe accurately what is happening in any given educational situation, let alone attribute any causal relationships. There is a methodological narrowness which too often commits educational researchers to an inappropriate input-output model of research and learning. And, underlying these problems, conceptualizations of learning and education are not clear and strong.

Given the problems and complexities inherent in attempting to improve education, it would be unwise to limit efforts to a single model of R&D, particularly the linear model of traditional educational R&D where each component is a discrete entity: Basic Research→Development→Evaluation→Dissemination→Application. This argues for a multiplicity of approaches, all carried on at the same time and feeding into and supporting one another, with activities falling into four major areas: building a knowledge base; spreading good practices; taking advantage of natural experiments; and sponsoring new experiments.

2. Likely Conditions

R&D supported by NIE is likely to operate under several constraints which must be considered in any research strategies (See Cohen, 1972).

a. Expectations. NIE is likely to have relatively short time in which to demonstrate "success" in at least some of its initiatives, despite the fact that the problems to be addressed are complex and long-standing in nature. This expectation of quick results is a product of past disappointment with educational R&D performance and the urgency of some current educational problems, the very reasons for the establishment of this new agency. However understandable they might be, demands for demonstrable successes over short periods are going to be difficult to meet, in part because success is difficult to define (see b. below), in part because there are no easy solutions to the problems of education. Therefore, NIE must use a mixed strategy of supporting projects that span the following dimensions:

Low risk/low gain-high risk/high gain
Quick but low payoff—long-range benefit

b. Shifting Values. It has already been pointed out that some of the currently perceived problems in education arise more from changing

educational goals and tasks than they do from objective conditions, which may in fact have improved. Insofar as taste and perception will continue to change, improving conditions to make them more responsive to today's values may be as irrelevant as meeting the goals of the '60's is for today. For R&D strategy, this argues for dealing in at least three modes (See Markley, *et al*, 1972): crisis-oriented, anticipatory, chronic problem-oriented.

c. Criteria for Setting Priorities. No solid criteria exist for assessing the impact, effectiveness, or productivity of R&D in general, but particularly not in that part of the social service sector depending in large part on human services. This is especially true for education because of the already documented lack of knowledge on what outcomes of education are important and how to measure them. Therefore, guidelines for setting R&D priorities are likely to be fuzzy, subject to political pressures from various (and conflicting) constituencies, and conditioned by educational fashion. This, together with the expectation of quick payoff noted above, may lead to NIE's not having the same kind of political stability as its counterpart agencies in, for example, health. Thus, it may be difficult to sustain the kind of funding needed for the long-term efforts which are likely to yield the most substantial benefits. This argues for highly sophisticated management which will know how to balance the demands of various interest groups while maintaining a solid R&D effort.

d. Knowledge About Alternative R&D Strategies. There is no real understanding about effects of alternative strategies or their relative merits in education. In part this results from the weak knowledge base in education, to which NIE itself is a response, but in good measure it arises from weak understanding of how to produce intentional change in societies. This implies a program of research on R&D itself, a program initiative addressed at greater length in Markley (1972).

C. Products of R&D

1. Target Audience

In order to achieve its objectives of improving educational substance and process in the three priority areas, information on results of R&D sponsored by NIE will have to address a very wide spectrum of potential users:

- a. Researchers in education, behavioral and natural sciences, and applied fields like management or evaluation;
- b. Policy- and decision-makers at the Federal, State and local levels;
- c. Educational administrators in higher and lower education, including professionals (university presidents, school superintendents) and lay boards and trustees;
- d. Educational innovators not part of the formal educational structure;
- e. Teaching staff at all educational levels;
- f. Support staff at all educational levels;
- g. Educational professional organizations;
- h. Parents;
- i. Students;
- j. Taxpayers; and
- k. Representatives of various community and non-education professional organizations including community action groups, unions (of teachers and others), Chambers of Commerce.

2. Products

Research and development generates a variety of products:

- a. Basic information, e.g., data and their analysis on such crucial determinants as the individual as learner, organization of education, within-system variables important to learning, interaction between education and community;
- b. Conceptualization and models which integrate basic information to build overall theory;
- c. Educational materials and devices such as texts, technology-mediated instruction (CAI, TV, film, video cassettes), individual instructional modules, tests and other methods for assessing progress;

d. Educational practices, including new approaches to organizing time and space, utilization and types of staff, administrative structure, out-of-school learning; and

e. Influence on relations between educational institutions and their clients or society-at-large; for example, changed patterns of financing, governance and decision-making, or improved access, information and choice for clients.

3. Dissemination and Utilization

Different dissemination methods are appropriate to different audiences and for different products. For some audiences, for instance researchers, a method is fairly well established, such as publication of monographs and articles in research journals, and accompanying abstracting and indexing services. Even for this best defined of all dissemination channels, procedures in education are weak, since there is no commonly shared set of journals and synthesis of scattered knowledge in a particular field is rare. How to build links between R&D results and utilization has been one of the areas of study for the NIE planning unit, and a separate document is being prepared on this aspect of R&D strategy. It is important, however, to note some of the barriers to utilization.

a. Modest Incentives. Even when information is available, for instance, on better practices or improved resource use, there is often no particular pressure on school systems or institutions of higher learning to change. Fiscal crises or disruptive expressions of client dissatisfaction may indeed create willingness to adopt ameliorative measures, but probably those that promise a "quick fix" and are not likely to produce lasting improvement.

b. Legal Restrictions. Some improvements, such as any that might involve leaving school early, cannot be instituted until laws and regulations restricting or preventing them are changed or loopholes are found. (Some Southern states with rigid textbook adoption requirements that mandate the use of hard-cover, commercial texts allow the use of "experimental" curricula which not infrequently results in local schools using the same soft-cover workbook style modules year after year—a good example of a loophole.)

c. Unknown Information Channels. An understanding of how information is obtained and on

what basis decisions are made to apply it is largely lacking. For instance, potential users at the local level appear to rely most on word-of-mouth sources of information, least on ERIC and other complex information systems.

d. Time Lag. In a linear model of R&D, there is considerable time lag between initiation of research and availability of any adoptable product. This makes it all the more important to establish a strategy pursuing various phases simultaneously with a variety of performers.

D. Some Cautions

The preceding brief consideration of R&D in education has included some suggestions for how NIE might structure its support programs to derive significant impact. But unless some crucial limitations are kept in mind, even the most carefully conceived R&D strategies are likely to founder. Some of the most important of the cautions concern the role of R&D in education, and the role of the federal government in changing social institutions (See Cohen, 1972).

1. Role of the Government

Proposals to develop alternative institutional arrangements, new roles, or new incentive systems may overstep the proper limits of government-sponsored research and development in a democracy. The character of institutions, the nature of social roles, and the arrangements for governing public services may be appropriate subjects for voting and debate, but not for manipulation by government agencies by way of development and evaluation. And even if this problem can be overcome, the unanticipated consequences of changing existing governance arrangements could be enormous. Most discussions of such changes focus on the dysfunctional aspects of schools, and the discontent with them, but probably the existing arrangements did not arise by accident; rather they respond to a complex system of custom, political tradition, public taste, and educational tradition. These might well overwhelm structural innovations.

2. Experimentation in the Absence of Theory

Many of the R&D initiatives in the preceding chapters imply very substantial experimentation in field situations. But experimenting with society in the context of a weak knowledge base and in the absence of

theory is difficult and potentially dangerous. When the variables and the range of possible effects are not known, how can one know when an experiment has succeeded or failed? This raises not only methodological but serious ethical and political questions, for social experimentation in the absence of adequate prior assessment of possibly damaging side effects had perhaps best not be undertaken at all. Therefore, one primary component of NIE's overall program effort must be to build better theory.

3. Planning R&D in a "Soft" Area

Despite the limitations and constraints that apply to any R&D regarding pervasive and deeply rooted social institutions, it is possible to plan and execute projects to effect change in such institutions. The World Bank, for instance, supports a loan program for population planning and control, an area at least as sensitive as education in its impacts on the mores of individuals and cultural traditions of society. However, intensive and prolonged planning, usually entailing three stages, precedes the implementation of each project:

a. Project Identification or Definition. A broad systematic analysis is carried out, examining as many factors as can be identified and studied that are likely to impinge on any proposed work. Generally, projects are based on strengthening any weak elements of the system analyzed. The analysis is carried out by interdisciplinary teams made up of Bank staff and local experts.

b. Project Presentation. When the analysis is

completed and elements needing support are identified, an overall program is developed and critiqued through several staff levels before approval from the governing board is sought.

c. Project Appraisal. After approval, negotiations among all parties (including Bank staff, country representatives, other lenders, administrators of involved institutions) are carried out, sometimes taking several missions lasting a month or longer, in order to arrive at clear agreements on details.

Only after these steps are completed successfully is the loan made, at which stage project supervision begins. Despite careful analysis and planning, decisions on what projects to fund entail a large component of judgment, because, as in education, there is not very much knowledge about what kinds of intervention work and about relationships between specific population planning methods and results achieved. For this reason, each project has built into it three components designed to make planning the next project a better-informed effort: an information system to collect data as the project proceeds, an analysis of the collected data, and specific well-defined experimentation aimed at knowledge gaps.

While not all the R&D initiatives suggested in Chapters IV, V, and VI will operate in sensitive areas, those that do (e.g., designing new schools, experiments with decision-making or incentive structures) may well require the kind of careful analytical planning described above. Chapter VIII incorporates these considerations in the discussion of budget priorities for the proposed NIE programs.

VIII. AN INTEGRATED R&D PROGRAM FOR FISCAL 1973

Development of an overall program for NIE which will accommodate OE activities to be transferred and the most promising new R&D initiatives should await an examination of the several program analyses currently under preparation. By applying the criteria suggested below, priorities should be assigned to all suggested new program areas, and those of high priority developed in much greater detail in order to establish their feasibility for inception in fiscal 1973. A summary of the initiatives

addressed to the goals of improving the quality of education, improving education for the disadvantaged, and improving resource use in education follows in order to facilitate the next planning steps.

A. Summary of R&D Initiatives

Suggested initiatives for each area and budgets for fiscal 1973 are listed in Table 5.

TABLE 5: ESTIMATED PROGRAM BUDGET

	<u>Quality</u>	<u>Fiscal 1973 (est.)</u>
Q-1	Complex Skills	\$.5 M
Q-2	Purveyors of Instruction	2.5
Q-3	Early Exit Experiment	.1
Q-4	Unbundling Higher Education	3.0
Q-5	Emerging Innovations	1.0
Q-6	Knowledge Base	.8
		7.9
	<u>Disadvantaged</u>	
D-1	Multidisciplinary Design of Educational Systems	.8
D-2	Educational Elements (6)	1.8
D-3	Problem-Oriented Courses	1.5
D-4	Anthropological Studies	2.0
D-5	Knowledge Compendium	.5
		6.6
	<u>Resources</u>	
R-1	Evaluation	5.0
R-2	Education Production	2.5
R-3	Choices and Decisions	3.0
R-4	Incentives and Rewards	2.0
R-5	Studies	.5
		13.0
TOTAL		<u>\$27.5 M</u>

1. Balance Among Priority Areas

The need for careful analytical planning detailed in Chapter VII is reflected in the low budgets for fiscal 1973 in certain priority areas, for instance, the Early Exit Experiment and the Multidisciplinary Design of Educational Systems. The high budget in the Resources area reflects the fact that all these program initiatives are strongly supportive of the goals in the other two areas, since they address the means by which education is furnished; hence, the Resources budget is in large part applicable to both Quality and Disadvantaged. In addition, there is almost no work in this area in any of the OE program components moving to NIE; for fiscal 1973, of the total amount of \$92.8 M estimated as committed to ongoing OE projects (Labs and Centers—\$32 M, Experimental School Programs—\$30 M, Career Education—\$25 M, Researcher Training and Knowledge Base—\$5.8 M), less than ten per cent could be classified as falling into the Resources category, with the rest being divided fairly evenly between Quality and Disadvantaged. Thus, for fiscal 1973, overall budgets in the three priority areas, if the suggested initiatives were to be carried out, would be roughly:

	Fiscal 1973 (est.)
Quality	\$50 M
Disadvantaged	50 M
Resources	20 M
Total	\$120 M

2. Addressing Educational Goals

The individual analyses for each priority area carried out in Chapters IV, V, and VI have already indicated the relevance of each suggested initiative to NIE's subgoals in these areas. Table 6 relates the initiatives to the goals of education listed in Chapter II and to the four interlinking modes of R&D noted in Chapter VII. The chart shows that the suggested new programs cluster heavily in the "Knowledge Base" and "New Experiments" columns. This is deliberate, since much of the OE program to be taken over falls into the areas of "Spreading Good Practice" (for instance, most activities of the Regional Laboratories) and "Taking Advantage of Natural Experiments" (the Experimental Schools Program), so that for the first year or so, these modes will in fact be more richly funded than the other two.

The goal of Career Skills is not heavily addressed by the initiatives since another major component (Career Education) to be transferred from OE is exclusively devoted to it (See Kooi, 1972). The goal of Academic Skills is more heavily addressed than either Social or Self-development Skills. There are at least three reasons for this: (1) cognitive learning, particularly of more complex skills, is still considered the main function of formal schooling, (2) the knowledge base, including ways to evaluate achievement, is weak for social and self-development goals, and (3) not much is going on by way of good practices or natural experiments to meet these goals. For the last two reasons, the initiatives in these areas concentrate on the knowledge base and new experiments.

The emphasis for all goals on the knowledge base reflects the strong conviction that one of NIE's primary functions is to become a center of expertise concerning major problem areas of education. The intramural component of the agency is expected to make a major contribution to building the sound base necessary if experimentation in education is to lead to lasting reform.

B. Criteria for Program Selection

The broad policy analyses being carried out by the NIE Planning Unit and several contractors will undoubtedly generate more program suggestions than NIE is likely to be able to initiate in fiscal 1973. Hence, carefully developed criteria must be employed to determine that subset of programs, selected from all the suggested programs, which should receive the highest priority for support.

The criteria to be applied after an examination of all the program suggestions will include:

1. Appropriateness as an activity for the Federal Government: Are state and local agencies unable to sponsor action? Is the program unattractive to the private sector? Does the program address a national need?
2. Appropriateness as an activity for NIE: Is the program an activity that is basic to the R&D mission of NIE? Could it be assumed by another agency? Is inter-agency cooperation desirable?
3. Potential significance: To what extent does

TABLE 6: R&D INITIATIVES AND THE GOALS OF EDUCATION

	Knowledge Base	Spreading Good Practice	Natural Experiments	New Experiments
Academic Skills	Q-1,Q-6 D-2,D-5 R-1	Q-2,Q-5 D-2	Q-2,Q-5 D-2	Q-1,Q-2,Q-4 D-1,D-2,D-3
Social Skills	Q-6 D-5 R-1	Q-5	Q-5	Q-1,Q-3 D-1,D-3
Career Skills	Q-6 D-5 R-1	D-2	Q-5	Q-1,Q-3 D-1,D-3
Personal Development or Attitudinal Skills	Q-6 D-5 R-1	D-2	Q-5	Q-1,Q-3 D-1,D-2,D-3
Equality and Access	Q-6 D-4,D-5 R-3,R-5	Q-2,Q-4	Q-2 D-4 R-3	Q-4 D-1 R-3
Responsiveness	Q-6 D-4,D-5 R-1,R-3,R-5	Q-4	Q-4 D-4 R-3,R-4	Q-3,Q-4 D-1 R-1,R-3,R-4
Productivity	R-1,R-2,R-4,R-5	R-2	R-2,R-4,R-5	R-1,R-2,R-4
Coordination	Q-6 D-4 R-3,R-5		R-3,R-5	Q-3,Q-4 R-3

the program respond to one of the central educational problems? Does it also respond to other problems? Do the probable outcomes of the program promise to make a significant contribution to the reform of the American educational system?

4. Feasibility of the program: Can it be expected to achieve its objectives within an appropriate time frame and at a cost commensurate with the results? Are the individuals and resources needed to implement the program readily available? Is it politically feasible?

5. Pay-off: What are the anticipated benefits? At what costs are they to be obtained? How does the cost/benefit estimate compare to those of other programs?

6. Adoptability: What is the likelihood of continued support of innovations resulting from the

program after federal funds are withdrawn? How costly will they be for local authorities to implement? What is the likelihood of adoption of secondary targets?

7. Potentially undesirable side-effects: Is there a possibility that the program will induce changes or create conditions in American education that are unintended and undesirable?

8. Program balance: Will the implementation of this program, considered in relation to the other programs supported by NIE, contribute to a well-balanced R&D effort that addresses all of the agency objectives?

Priorities for new program areas, the integration of new programs and the activities to be transferred from OE, and the budget plan will be completed in the near future.

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APPENDIX A

QUANTITATIVE PARAMETERS OF U. S. EDUCATION

This appendix presents current data and projections concerning school enrollment, staffing, school organization, and funding to provide a broad quantitative overview of the educational system in the United States. Most of the statistics are derived from the annual and biennial surveys and estimates prepared by the Office of Education (1971), National Education Association (1971), and the Department of Commerce/Bureau of the Census (1972); other references are given in the text.

1. Number of Students and Distribution

a. Enrollments. The increase in school enrollments during the sixties is projected to taper off during the next decade (See Table A-3). By 1975, a 10% decline is expected in elementary school (K-8) enrollment from the current 36.7 million to 33 million. The number of students will then increase to 36-42 million by 1985, the amount depending almost entirely on the number of births, since nearly all of this age group are enrolled in school. Current secondary school (9-12) enrollment of 14.7 million will rise to 16 million by 1975 and then decline to 13.7 million by 1985.

For the next 30 years, enrollments will remain relatively stable at about 14-17 million if number of births tend toward replacement level (2.11 children per woman), but could rise as high as 23 million by the year 2000 given a birth rate of 2.78 children per woman in the next decade. Enrollment rates will be little affected by increased attendance, since for 14-17 year olds this is estimated at 95% in 1975 and 98.7% by 2000.

25% did. These increases are being felt more in the public than in the private institutions (5 out of every 7 students are now enrolled in public institutions), more in the junior colleges than in the 4-year colleges, and more in the larger than in the smaller institutions (U. S. Office of Education, *Report on Higher Education*, 1971).

b. Geographic Distribution. Public school students were distributed fairly evenly among the four regions of the U. S. (See Table A-4). Public school enrollment is less in the inner cities (12 million in 1969) than in metropolitan areas outside the central cities (17 million) or in nonmetropolitan areas (16 million).

Most college students attend a college in their home state. In 1971, 50% of all entering freshmen lived within 50 miles of their college (73% of two-year college students, 35% of four-year college or university students). Only 8% of all students were attending schools more than 500 miles from their homes.

c. Socioeconomic and Other Characteristics. School attendance is lower for children in poverty areas than for children of richer families (U. S. Bureau of the Census, 1970).

The largest percent of college students come from families with incomes between \$8-20,000 per year. Low income (\$8,000 or under) students represent 21% of the total student population (26% of the 2-year, 20% of the 4-year, 14% of the university population); students from high income families make up 18% of the total population. Increasingly, the college age population

Children Not in School

Poverty Areas

14.1% for 5 and 6 years
3.3% for 14 and 15 years
67.5% for 18 and 19 years

Enrollment in higher education has increased by 50% in the last decade, and is expected to increase from the current 7.7 million to 10 million by fall of 1977 (See Table A-9).

Today, more than half of the 18-21 year olds enter post-secondary institutions; twenty years ago, less than

Nonpoverty Areas

7.0% for 5 and 6 years
1.3% for 14 and 15 years
44.9% for 18 and 19 years

extends beyond 18-21. In 1970, freshmen men older than 18 at public two-year colleges constituted 44% of the entering class. If this trend continues, college enrollments will become less and less tied to demographic variations. An increasing number of females are going to college, up from 35% of all students in 1958 to an estimated 43% by 1978.

It is estimated that by 1980 nearly all (over 90%) of the academically gifted will be entering college. After 1975, further increases in the proportion of high school youth attending college will increasingly lead to declining average ability levels among all college entrants (Folger, *et al*, 1970).

d. Retention Rates. The number of high school graduates has increased from 1.9 million in 1960 to 3 million in 1970, representing an increase in proportion from less than two-thirds to more than three-fourths. It is, however, instructive to examine the retention range of ninth graders, which varies from 93.4% (Minnesota) to 65.7% (Georgia). College entry and retention rate have also increased markedly. Of the 1961 fifth-grade group, 45% entered college in 1969; 22% are likely to earn a four-year degree in 1973 (See Figure A-3).

The average rate of attrition in college has been quite stable over the past 40 years, with current rates being 22% completion among two-year college students as compared to 60% for students at four-year institutions. The number of Ph.D.'s awarded has doubled in the last decade, from about 9,000 to over 19,000 per year.

2. Staffing

a. Numbers. 2.5 million professionals were employed in public and private schools, of whom 90% were classroom teachers. The number of classroom teachers increased from 1.5 million in 1959 to 2.2 million in 1969, but is projected to hold nearly steady during the next decade.

There will actually be a decrease in elementary school teachers offset by an increase in secondary school teachers, since the effects of the 1960's birth rates will not be felt at the high school levels until the mid '70's (See Table A-5). The demand for teachers during the next decade will be lower: 165,000 additional teachers will be needed in 1975; 171,000 in 1979. This compares with 194,000 for 1965 and 232,400 for 1969. Teacher demand is based on enrollment levels, replacement needs, and added staff for lowered pupil-teacher ratios. A slight decrease in this ratio is expected over the next decade, from 22.7:1 to 21.8:1. The number of instructional staff in higher education has increased 105% (from 200,000+ to 411,000) in the last decade while degree credit enrollment increased 116%; faculty will increase by 39% in the next decade and degree

credit enrollment by 52%. Close to 80% of all faculty positions are held by men (American Council on Education, 1971).

b. Training. The bachelor's degree has been completed by over 95% of classroom teachers, the master's by 24% (See Table A-6). Only one-half of those people entering teacher training actually go on to teach; 30% of those graduating with teaching certificates never enter the classroom. After three years, only 15% of those who went into teaching remain.

In 1950, one-third of all faculty in universities held doctorates; by 1966, this figure was one-half. By contrast, 5% of all two-year college faculty hold doctorates, 64% master's degrees. While in the past, only 2 or 3% of the annual doctorate output has entered jobs in junior colleges, this percentage is likely to increase due to competition for jobs in the four-year colleges and universities.

3. Organization

At the school level, about 20% of the total enterprise is non-public, a steadily falling proportion. Public school districts continue to decline in number, from over 40,000 in 1959-60 to about 19,000 at present (See Figure A-2). Nearly four-fifths of this decrease occurred in the Midwest, the region that still has close to one-half of the school districts in the country. Public school systems with enrollments under 300 constitute nearly half of the total number; those enrolling 6,000 or more students account for only 6% of the public school systems.

There are about 70,000 elementary schools and 25,000 secondary schools in the country. Approximately 1,764,500 instruction rooms were being used at the beginning of the 1968-1969 school year, an increase of more than half a million over the number available ten years earlier. Increased enrollments and reduction in pupils from 27.7 to 25.5 per room account for this construction boom.

An increasing percentage of all higher education institutions are under public control (from 34% in 1950 to 43% in 1970); currently there are 1,100 publicly and 1,470 privately controlled institutions. This shift in control is largely the result of the growth of community colleges. While only 7% of the institutions have enrollments of 10,000 or over, they enroll over 50% of

all college students. Over 50% of the institutions of higher education in the United States offer noncredit continuing (adult) education activities (two-thirds of the public and one-third of the private institutions).

4. Costs

a. Amounts. Total elementary and secondary school expenditures are increasing, from \$23.9 billion (in current dollars) in 1959-60 to \$45.4 billion in 1969-70. (See Tables A-17 and A-18). While school enrollment increased 16% at the elementary and 40% at the secondary level, expenditures more than doubled. The projection for 1974-75 is \$50.1 billion and \$55.2 billion by 1979-80.

c. Allocations. The percentage distribution of expenditures for public elementary and secondary schools has remained relatively constant since 1960. The largest item is salaries of instructional staff, accounting for about 55% of current expenditures. About 25% to 30% goes for administration, transportation, and plant operation and maintenance. Capital outlay currently accounts for about 12% of the distribution of expenditures and has been decreasing since the peak year of 1957-58, due mainly to declining enrollments.

A recent detailed study of U. S. third grades indicates that over 65% of school costs are direct personnel costs and that 11% goes for the essentially non-school item of lunch (See Table A-19). This same

Data for 1969-1970

	<u>Federal</u>	<u>State</u>	<u>Local</u>
Mississippi	22.0%	51.6%	26.4%
Wyoming	22.3%	25.4%	52.3%
New Hampshire	4.2%	8.5%	87.2%
Delaware	7.6%	70.6%	21.8%
New York	3.5%	45.4%	51.1%

Higher education shows even steeper increases, from \$8.9 billion in 1959-60 to \$24.9 billion ten years later to a projected \$42.2 billion by 1979-80. (See Figures A-7 and A-8). The shift from private to public institutions is evident: in 1959-60, nearly 45% of higher education expenditures were in non-public institutions; ten years later, the percentage had shrunk to 34%. In another decade, total education expenditures are estimated to increase nearly another 50% to almost \$100 billion (in constant dollars).

b. Sources of Funds. Public school costs are met mostly by local and state governments; in 1969-70, the Federal government contributed on the average only 6.6%. The range varies greatly, however.

study indicates what is provided to the student: in a typical day, he spends 4.6 hours receiving instruction in a class with 26.3 other students from a teacher who makes \$9,025 a year. The student spends .31 hours in physical education, .69 hours at lunch, .36 hours at recess, and .21 hours in homeroom during a school day of 6.17 hours. A school year is constituted of 178.8 such days.

The most striking feature of fund allocations in higher education is the decrease in the percent of funds spent for instruction and the increasing percentage spent for research, particularly for private universities (See Table A-20).

TABLE A-1

PUBLIC SERVICES AS A PERCENTAGE OF THE
GROSS NATIONAL PRODUCT

	1950	1955	1960	1963	1965	1966	1967	1968	1969	1970
GNP in Billions of Dollars (p.311)	284.00	398.00	503.00	590.00	685.00	750.00	793.00	865.00	932.00	960.00*
Health Expenditure in Billions of Dollars	13.10	18.70	26.70		40.50		49.00	56.00	62.50	66.00*
As % of GNP (p.62)	4.60	4.70	5.30		5.90		6.20	6.50	6.70	6.90
Education Expenditure in Billions of Dollars	9.70		25.70		44.00			60.50	66.20	68.00
As % of GNP (p.104)	3.40		5.10		6.40			7.00	7.10	7.10
Defense Expenditure in Billions of Dollars		44.40	45.90	52.30	49.60	56.80	70.00	80.50	81.20	79.40
As % of GNP (p.246)		9.90	9.10	8.90	7.25	7.60	8.85	9.30	8.70	8.20
Post Office Expenditure in Billions of Dollars	2.20	2.70	3.87		5.27	5.73	6.25	6.68	7.28	
As % of GNP (p.488)	0.78	0.68	0.765		0.77	0.77	0.78	0.77	0.78	
Welfare Expenditure in Billions of Dollars	2.49	3.00	4.10	5.30	6.28	7.30	8.81	11.09	13.44	
As % of GNP (p.276)	0.88	0.76	0.81	0.90	0.92		1.10	1.18	1.43	
Public Protection Expenditure in Billions of Dollars		2.23	2.35		4.73	4.90	5.40	5.90		
As % of GNP (p.248)		0.56	0.47		0.69	0.66	0.68	0.68		

* Estimated

Page references from U.S. Bureau of the Census, *Statistical Abstract of the United States: 1970*, 91st Edition, Washington, D.C. 1970.

TABLE A-2

GOALS FOR THE 1960'S COMPARED WITH ACHIEVEMENTS

The Specific Goal Proposed	The Target Set for 1970	Achievement by 1970 (or closest year available)	
"A higher proportion of the gross national product must be devoted to educational purposes."	5 percent	(1969)	7.5 percent
"Annual public and private expenditure for education by 1970 must be approximately 40 billion."	40 billion	(1960 dollars)	\$46.0 billion (current dollars) \$69.5 billion
"Teacher salaries at all levels must be improved." (Average salary for 1960, \$5,174—adjusted for price changes, \$6,648).		(1970)	\$8,840 (increase of 70.8% in money wages and 33.0% in real wages)
"Small and inefficient school districts should be consolidated." (There were 40,000 school districts in 1960).	10,000	(1969)	18,224 Total operating districts
"Within the next decade at least 2/3 of the youths in every state should complete twelve years of schooling..."	.67	(1968)	Lowest state 65.7 U.S. average 78.8
"At least 1/3 (of the students) should enter college."	.33	(1968)	30.4
"There must be more and better teachers." (Number of teachers in 1960—1.8 million).		(1970)	2.9 million

Source: The American Assembly, *Goals for Americans: Programs for Action in the Sixties*, (Spectrum, 1960). See especially pp. 6-7.

TABLE A-3

ESTIMATES AND PROJECTIONS OF FALL SCHOOL ENROLLMENT
BY LEVEL FOR POPULATION SERIES C AND E AND
ENROLLMENT SERIES 1, 2, AND 3: 1970 to 2000

(In thousands. Civilian noninstitutional population 5 to 34 years old as of October. Series "1" and "2" relate to the projected enrollment rates; "C" and "E" to the population series to which the rates were applied. See attachment for assumptions underlying each series.)

Enrollment Estimates, Projection Series, and Year	Series C		Series E	
	Elementary School and Kindergarten	High School	Elementary School and Kindergarten	High School
Estimates: 1970	36,676	14,716	36,676	14,716
Projections:				
Series 1:				
1975	(-) 32,915	(+) 16,114	(-) 32,895	(+) 16,114
1980	(+) 34,565	(-) 15,133	(-) 32,835	(-) 15,133
1985	(+) 42,026	(-) 14,523	(+) 36,075	(-) 14,372
1990	(+) 47,960	(+) 18,037	(+) 38,378	(+) 16,035
2000	(+) 49,423	(+) 22,887	(+) 37,317	(+) 17,965
Series 2:				
1975	(-) 32,832	(+) 15,939	(-) 32,811	(+) 15,939
1980	(+) 34,374	(-) 14,814	(-) 32,665	(-) 14,814
1985	(+) 41,719	(-) 14,117	(+) 35,824	(-) 13,966
1990	(+) 47,560	(+) 17,462	(+) 38,064	(+) 15,498
2000	(+) 48,904	(+) 21,934	(+) 36,934	(+) 17,191
Series 3:				
1975	(-) 32,748	(+) 15,763	(-) 32,728	(+) 15,763
1980	(+) 34,182	(-) 14,495	(-) 32,496	(-) 14,495
1985	(+) 41,411	(-) 13,711	(+) 35,572	(-) 13,561
1990	(+) 47,161	(+) 16,888	(+) 37,749	(+) 14,961
2000	(+) 48,385	(+) 20,981	(+) 36,551	(+) 16,418

(+) Increase in Enrollment

(-) Decrease in Enrollment

Source: U. S. Bureau of the Census, "Projections of School and College Enrollment: 1971 to 2000, *Current Population Reports*, January, 1972.

Explanation of Series: These projections are based on the 1970 census population by age and sex for April 1, 1970. The Series C and E use identical assumptions of mortality and immigration, differing only according to the fertility assumptions involved. Projects for Series C and E assume that, on the average, women will bear 2.78 and 2.11 children respectively during their lifetimes. Both Series assume a net immigration of 400,000 per year. Mortality rates are based on projections to the year 2000 prepared by the Division of the Actuary, Social Security Administration. Two series were designed assuming different rates of increase in enrollment and a third series assumes no increase. Series 1 reflects a relatively rapid increase in future enrollment rates (representing the average annual rate of change of the 1950-1970 period) and Series 2 reflects a moderate increase in the rates which is about one-half as great as Series 1. Series 3 represents constant 1970 rates of enrollment.

TABLE A-4

PUPILS IN LOCAL PUBLIC SCHOOL SYSTEMS, BY METROPOLITAN
STATUS, REGION, ORGANIZATIONAL LEVEL, AND GRADE:
UNITED STATES, FALL 1969

Organizational Level and Grade	Total	Metropolitan Status			Region				
		Metropolitan Central	Metropolitan Other	Nonmetro- politan	North Atlantic	Great Lakes and Plains	Southeast	West and Southwest	
All Levels	45,521,775	12,115,758	17,133,679	16,272,339	10,472,679	12,393,620	10,826,694	11,828,784	
Elementary, Total	27,346,406	7,358,695	10,177,327	9,810,384	6,155,134	7,392,837	6,563,432	7,235,003	
Prekindergarten	53,104	29,583	17,341	6,180	27,450	8,359	2,998	14,297	
Kindergarten	2,480,580	785,244	1,053,776	641,560	756,205	964,431	120,334	639,610	
First Grade	3,875,310	1,042,130	1,406,075	1,427,105	841,053	1,003,668	1,001,885	1,028,704	
Second Grade	3,710,035	988,199	1,363,983	1,357,852	797,874	969,652	941,724	1,000,785	
Third Grade	3,719,533	995,137	1,376,309	1,348,087	802,196	978,983	946,525	991,830	
Fourth Grade	3,666,243	964,523	1,359,815	1,341,905	791,484	956,410	937,024	981,325	
Fifth Grade	3,639,221	943,905	1,354,699	1,340,617	786,607	946,915	934,498	971,202	
Sixth Grade	3,593,620	926,266	1,342,334	1,325,020	782,624	928,324	921,064	961,608	
Seventh Grade	1,128,839	265,588	374,099	489,152	198,958	256,634	411,631	261,617	
Eighth Grade	891,250	217,577	313,400	360,273	180,520	231,471	221,363	257,895	
Unclassified	588,672	200,543	215,496	172,634	190,165	147,992	124,385	126,131	
Secondary, Total	18,175,370	4,757,063	6,956,353	6,461,954	4,317,545	5,000,783	4,263,262	4,593,780	
Seventh Grade	2,550,785	678,066	1,009,569	863,150	631,350	702,661	538,587	678,187	
Eighth Grade	2,660,957	677,351	1,016,548	967,058	610,701	695,585	692,396	662,275	
Ninth Grade	3,561,464	921,859	1,344,856	1,294,748	840,045	968,259	886,975	866,185	
Tenth Grade	3,380,149	897,676	1,281,489	1,200,984	809,221	931,665	809,435	829,828	
Eleventh Grade	3,043,226	788,830	1,158,662	1,095,733	714,684	848,863	702,498	777,181	
Twelfth Grade	2,725,927	682,390	1,048,399	995,138	641,666	771,513	618,475	694,273	
Unclassified	222,075	103,226	76,354	42,495	66,501	76,122	14,815	64,638	
Postgraduate	30,786	7,664	20,475	2,647	3,377	6,114	81	21,214	

Note: Data are sample estimates; detail may not add to totals because of rounding.

Source: U.S. Office of Education. *Statistics of Local Public School Systems, Fall, 1969, Pupils and Staff.*

TABLE A-5

CLASSROOM TEACHERS IN REGULAR ELEMENTARY AND SECONDARY
DAY SCHOOLS, BY INSTITUTIONAL CONTROL AND ORGANIZATIONAL LEVEL:
UNITED STATES, FALL 1959 TO 1979

(In Thousands)

Year (Fall)	Total Public and Nonpublic			Public			Nonpublic (Estimated)		
	K-12	Elementary	Secondary	K-12	Elementary	Secondary	K-12	Elementary	Secondary
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1959	1,531	952	580	1,355	832	524	176	120	56
1960	1,600	991	609	1,403	858	550	192	133	59
1961	1,668	1,015	653	1,461	869	592	207	146	61
1962	1,727	1,036	690	1,503	886	621	219	150	69
1963	1,866	1,062	743	1,578	908	669	223	154	74
1964	1,882	1,096	786	1,648	940	708	234	156	78

A. Includes Effect of Elementary and Secondary Education Act of 1965

ACTUAL									
1965	1,951	1,122	828	1,710	965	746	240	158	82
1966	2,032	1,167	856	1,789	1,006	783	243	161	83
1967	2,037	1,193	895	1,855	1,040	815	232	152	80
1968	2,162	1,223	938	1,936	1,076	880	225	147	78
1969	2,241	1,255	985	2,014	1,103	906	227	147	80

PROJECTED									
1970	2,275	1,261	1,014	2,050	1,115	935	225	146	80
1971	2,289	1,247	1,041	2,065	1,103	962	224	144	80
1972	2,295	1,229	1,067	2,073	1,036	987	222	143	80
1973	2,303	1,203	1,095	2,030	1,084	1,015	224	144	80
1974	2,306	1,192	1,114	2,080	1,046	1,034	225	146	80
1975	2,305	1,180	1,126	2,079	1,033	1,016	226	147	80
1976	2,303	1,175	1,133	2,030	1,027	1,033	228	148	80
1977	2,311	1,180	1,130	2,032	1,031	1,051	229	149	80
1978	2,316	1,192	1,123	2,035	1,042	1,044	230	150	80
1979	2,320	1,217	1,104	2,039	1,065	1,024	231	152	80

B. Excludes Effect of Elementary and Secondary Education Act of 1965

ESTIMATED									
1965	1,921	1,117	804	1,690	959	721	240	158	82
1966	1,963	1,139	824	1,720	979	741	243	161	83
1967	1,996	1,144	852	1,704	992	772	232	152	80
1968	2,042	1,142	899	1,817	995	822	225	147	78
1969	2,074	1,146	928	1,847	993	849	227	147	80

PROJECTED									
1970	2,095	1,141	954	1,870	995	875	225	146	80
1971	2,103	1,127	931	1,895	983	902	224	144	80
1972	2,115	1,109	1,006	1,893	966	927	222	143	80
1973	2,123	1,003	1,035	1,900	944	955	224	144	80
1974	2,126	1,072	1,054	1,900	926	974	225	146	80
1975	2,125	1,060	1,066	1,899	913	986	226	147	80
1976	2,128	1,055	1,073	1,900	907	993	228	148	80
1977	2,131	1,060	1,070	1,902	911	991	229	149	80
1978	2,136	1,072	1,053	1,906	922	934	230	150	80
1979	2,140	1,057	1,044	1,909	945	964	231	152	80

Source: U.S. Office of Education, National Center for Educational Statistics,
Projections of Educational Statistics to 1979-80, 1971.

TABLE A-6

PERCENT DISTRIBUTION OF CLASSROOM TEACHERS, BY HIGHEST LEVEL OF EDUCATION COMPLETED
FOR ENROLLMENT-SIZE GROUPS, METROPOLITAN-STATUS, CATEGORIES, AND REGIONS:
UNITED STATES, FALL 1969

Enrollment Size, Metropolitan Status and Region	Total	Highest Level of Education Completed				Attained at least a Bachelor's Degree	Attained at least a Master's Degree
		Less Than Bachelor's	Bachelor's Degree	Master's Degree	Doctor's Degree		
Total	100.0	4.4	71.4	24.1	0.1	95.6	24.2
Enrollment Size:							
25,000 and over	100.0	2.3	70.6	26.8	.3	97.7	27.1
10,000 - 24,999	100.0	2.9	69.5	27.5	.1	97.1	27.6
5,000 - 9,999	100.0	3.7	70.8	25.4	.1	96.3	25.5
2,500 - 4,999	100.0	5.0	71.6	23.3	.1	95.0	23.4
300 - 2,499	100.0	7.1	74.9	18.0	(1/)	92.9	18.0
Under 300	100.0	21.9	65.9	12.2	0.0	78.1	12.2
Metropolitan Status:							
Metropolitan, Central	100.0	2.9	68.9	27.9	.3	97.1	28.2
Metropolitan, Other	100.0	3.2	70.7	26.0	.1	96.8	26.1
Nonmetropolitan	100.0	6.7	73.7	19.5	.1	93.3	19.6
Region:							
North Atlantic	100.0	6.0	66.1	27.7	.2	94.0	27.9
Great Lakes and Plains	100.0	5.8	70.5	23.6	.1	94.2	23.7
Southeast	100.0	4.3	77.6	18.0	.1	95.7	18.1
West and Southwest	100.0	1.3	71.9	26.6	.2	98.7	26.8

1/ Less than 0.05 percent.

Source: U.S. Office of Education, *Statistics of Local Public School Systems, Fall 1969, Pupils and Staff*.

TABLE A-7

YEARS OF SCHOOL COMPLETED BY PERSONS 25-29 YEARS OLD
BY RACE AND SEX, MARCH 1969

Percent Distribution

Total Population (In Thousands)	Elementary				High School				College					Percent With Less than 4 Yrs. High School
	0-4 yrs	5 yrs	6-7 yrs	8 yrs	1 yr	2 yrs	3 yrs	4 yrs	1 yr	2 yrs	3 yrs	4 yrs	5 yrs	
All Males 6341	1.5	0.5	2.4	5.1	4.6	5.6	4.6	39.9	6.6	6.6	3.0	10.4	9.0	24.3
All Females 6608	1.2	0.4	2.3	4.6	5.0	7.3	5.4	48.2	5.2	5.4	2.3	9.7	3.0	26.2
White Males 5628	1.4	0.5	2.2	5.0	4.2	5.4	3.9	39.7	7.0	6.9	3.3	11.0	9.6	22.6
White Females 5807	1.0	0.3	2.1	4.3	4.5	6.4	4.8	49.7	5.5	5.6	2.4	10.3	3.1	23.4
Negro Males 654	2.4	0.6	5.1	5.7	7.6	7.8	11.2	41.5	4.1	5.1	0.8	5.0	3.1	40.4
Negro Females 728	2.6	1.0	3.7	6.7	8.9	15.0	9.9	38.8	2.6	3.9	1.5	4.5	1.0	47.8

Source: U.S. Bureau of the Census, "Educational Attainment: March 1969," in
 "Population Characteristics," *Current Population Reports*, Series P-20, No. 194
 (February 19, 1970).

TABLE A-8
ADJUSTED AVERAGE INCOME BY GEOGRAPHIC DIVISION
AND YEARS OF SCHOOL COMPLETED
(1960 CENSUS)

Division	Years of School Completed						Average Increase In Income Per Year of Schooling
	0	1-4	5-7	8	9-11	12	
North Central							
East North Central	\$2,150	\$2,470	\$2,990	\$3,530	\$4,310	\$5,170	\$250
West North Central	1,820	2,350	2,590	3,056	3,560	4,110	180
South (white)							
South Atlantic	1,410	1,730	2,240	2,630	3,290	3,890	210
East South Central	1,280	1,550	1,960	2,380	3,200	4,360	240
West South Central	1,320	1,620	2,260	2,280	3,210	3,350	170
South (nonwhite)							
South Atlantic	1,120	1,200	1,380	1,610	1,700	2,073	80
East South Central	1,010	1,050	1,214	1,360	1,460	1,647	60
West South Central	1,090	1,160	1,300	1,410	1,520	1,737	50
West							
Mountain	1,960	2,600	2,920	3,330	3,840	4,354	190
Pacific	2,160	2,760	3,530	4,260	5,140	6,189	330

Source: Welch, F., "Measurement of the Quality of Schooling." *American Economic Review*, May, 1966.

TABLE A-9

SUMMARY OF DEGREE CREDIT ENROLLMENT IN ALL INSTITUTIONS
OF HIGHER EDUCATION, BY LEVEL AND INSTITUTIONAL TYPE:
UNITED STATES, FALL 1958 TO 1978

(Resident and extension opening fall enrollment—in thousands)

Year (fall)	Total degree-credit enrollment	Resident graduate (4-year)	Level and Type					
			Undergraduate and first professional (4-year)			Undergraduate (2 year)		
			Total	First-Time	Other	Total	First-Time	Other
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1958	3,237	312	2,539	600	1,939	385	175	211
1959	3,377	331	2,636	640	1,996	410	182	228
1960	3,583	356	2,776	709	2,067	451	214	237
1961	3,860	386	2,956	775	2,181	518	244	274
1962	4,175	422	3,163	770	2,393	590	260	329
1963	4,495	464	3,406	775	2,631	625	272	353
1964	4,950	517	3,722	903	2,819	711	322	389
1965	5,526	582	4,103	1,041	3,062	841	401	441
1966	5,929	624	4,360	989	3,371	945	389	556
1967	6,391	688	4,628	992	3,636	1,075	447	628
1968	6,928	768	4,871	1,076	3,795	1,289	554	736
PROJECTED								
1969	7,087	798	4,948	1,130	3,818	1,341	599	742
1970	7,377	844	5,116	1,189	3,927	1,417	647	770
1971	7,743	900	5,334	1,245	4,089	1,509	695	814
1972	8,157	963	5,583	1,296	4,287	1,611	741	870
1973	8,571	1,028	5,829	1,342	4,487	1,714	785	929
1974	8,963	1,092	6,057	1,389	4,668	1,814	830	984
1975	9,343	1,157	6,274	1,432	4,842	1,912	874	1,038
1976	9,693	1,219	6,469	1,463	5,006	2,005	909	1,096
1977	10,006	1,278	6,638	1,498	5,140	2,090	948	1,142
1978	10,318	1,339	6,803	1,544	5,259	2,176	995	1,181

Source: U.S. Office of Education, *Projections of Educational Statistics to 1978-79, 1969*.

TABLE A-10
COLLEGE ATTENDANCE IN 1967
AMONG HIGH SCHOOL GRADUATES, BY FAMILY INCOME^a

<u>Family Income^b</u>	<u>Per Cent who did not Attend College</u>
Total	53.1
Under \$3,000	80.2
\$3,000 to 3,999	67.7
\$4,000 to 5,999	63.7
\$6,000 to 7,499	58.9
\$7,500 to 9,999	49.0
\$10,000 to 14,999	38.7
\$15,000 and Over	13.3

^a Refers to individuals who were high school seniors in October 1965 and who subsequently graduated from high school. Source: U.S. Department of Commerce, Bureau of the Census, *Current Population Report*, Series P-20, No. 185, July 11, 1969, p. 6. College attendance refers to both two- and four-year institutions.

^b Family income for 12 months preceding October 1965.

Source: Bowles, Samuel S. "Unequal Education and the Reproduction of the Social Division of Labor," *URPE Review*, Winter 1971, pp. 1-31.

TABLE A-11

MEDIAN INCOME FOR NEGRO AND WHITE MEN
25 TO 54 YEARS OLD IN 1969 BY HIGHEST GRADE COMPLETED

Years of School Completed	Median Income		Negro Income as Percent of White
	Negro	White	
Elementary:			
Less than 8 years	\$3,922	\$ 5,509	71
8 Years	4,472	7,018	64
High School:			
1 to 3 years	5,327	7,812	68
4 years	6,192	8,829	70
College:			
1 to 3 years	7,427	9,831	76
4 years or more	8,669	12,354	70

Source: U.S. Bureau of the Census, "The Social and Economic Status of Negroes in the United States, 1970," Special Studies, *Current Population Reports*, Series P 23, No. 38, p. 34.

TABLE A-12

RATES OF RETURN TO INVESTMENT IN EDUCATION BY SEX
(PER CENT)

Educational Level Country	Primary		Secondary		Higher	
	Males	Females	Males	Females	Males	Females
United States	17.8	5.6	14.0	13.0	9.7	4.2
Puerto Rico	17.1	17.2	21.7	20.9	16.5	6.3
Colombia	15.3	---	26.5	13.5	2.9	3.6
Germany	---	---	---	---	4.6	6.0
Greece	---	---	3.0	5.0	---	---
Kenya	21.7	7.1	23.6	19.5	---	---
Malaysia	9.4	9.3	12.3	11.4	10.7	9.8
New Zealand	---	---	19.4	25.3	13.4	13.5

Note: All rates are social except for Germany. Puerto Rico rates refer to urban males and females only. Kenya rates are for junior secondary only.

Source: Psacharopoulos George, *Returns to Education: An International Comparison*, Higher Education Research Unit, London School of Economics and Political Science, forthcoming.

TABLE A-13
REPORTED VOTER PARTICIPATION IN
1968 PRESIDENTIAL ELECTION

Years of Schooling	Proportion Voting			
	Whites		Blacks	
	Males	Females	Males	Females
0-4	45.4	32.0	43.2	34.7
5-7	60.5	46.1	54.9	53.5
8	68.4	59.8	59.7	53.3
9-11	67.5	62.7	61.7	59.4
12	76.3	75.6	74.8	69.5
13-15	80.7	82.5	79.7	79.4
16	85.2	84.2	85.8	83.7
17 or more	86.4	88.3	88.4	---

Source: U.S. Bureau of the Census, "Years of School Completed—Reported Voter Participation in 1968 and 1964 for Persons 25 Years Old and Over, by Race and Sex, for the United States: November 1968," *Current Population Reports*, Series P 20, No. 192.

TABLE A-14

SCHOOL BOND ELECTIONS,
FISCAL 1962 THROUGH 1971

Number of Public Elementary and Secondary School Bond Elections
Held and Number and Percent Approved,
Fiscal 1962 Through 1971

Fiscal Year Ending	Number of Elections		Percent Approved
	Total	Approved	
1962	1,432	1,034	72.2
1963	2,048	1,482	72.4
1964	2,071	1,501	72.5
1965	2,041	1,525	74.7
1966	1,745	1,265	72.5
1967	1,625	1,082	66.6
1968	1,750	1,183	67.6
1969	1,341	762	56.8
1970	1,216	647	53.2
1971	1,086	507	46.7

Par Value of Public Elementary and Secondary School Bond Elections
Held and Par Value and Percent Based on Value Approved,
Fiscal 1962 Through 1971

Fiscal Year Ending	Total	Approved	Percent Approved
1962	\$1,849	\$1,273	68.9
1963	2,659	1,851	69.6
1964	2,672	1,900	71.1
1965	3,129	2,485	79.4
1966	3,560	2,652	74.5
1967	3,063	2,119	69.2
1968	3,740	2,338	62.5
1969	3,913	1,707	43.6
1970	3,285	1,627	49.5
1971	3,337	1,381	41.4

Source: U.S. Office of Education, Circulars, *Bond Sales for Public School Purposes*.

TABLE A-15
SUITS PENDING AS OF NOVEMBER 1, 1971

State Name	Case Caption	Pleading on File at the Lawyers' Committee for Civil Rights Under Law
Arizona	<i>Hollings v. Shofstall</i>	Complaint Only (filed 10/12/71)
California	<i>Serrano v. Priest</i>	Complete pleadings file, except October California Supreme Court opinion amending the August 30th decision
Colorado	<i>Allen v. Otero</i>	Complaint only (filed 9/3/71)
Illinois	(a) <i>Blase v. State of Illinois</i> (b) <i>Scarboro v. State of Illinois</i>	Complaint only (filed 9/2/71) Complaint only (filed 10/2/71)
Indiana	?	No complaint received (filed 10/2/71)
Maryland	<i>Parker v. Mundel</i>	Complaint only (filed 10/1/71)
Michigan	(a) <i>Detroit Board of Education v. State of Michigan</i> (b) <i>Milliken v. Green</i>	Complaint only (filed 6/19/68) Complaint only (filed 10/15/71)
Minnesota	<i>Van Duzart v. Hatfield</i>	Three complaints filed – consolidated into one decision (10/12/71)
New Jersey	<i>Robinson v. Cahill</i>	Complaint only (filed 2/17/70)
New York	?	No complaint received (filed by Michael Richmond in Westchester County, 10/2/71)
Texas	(a) <i>Fort Worth Independent School District v. Edgar</i> (b) <i>Guerra v. Smith</i> (c) <i>Rodriguez v. San Antonio Independent School District</i>	Complaint only [filed 1969 (?)] and plaintiff's trial brief Complaint (filed 1/28/69) and complete pleading file up to order by Judge Roberts (1/20/71) Third Amended Complaint (filed 10/2/68)

Compiled by Lawyers' Committee for Civil Rights Under Law.

TABLE A-16

EDUCATION EXPENDITURE EFFECTIVENESS

	1950	1960	1965	1966	1968	1969	1970
Input - Costs as % GNP and per Capita GNP (p.104)	3.400	5.100	6.400	6.600	7.000	7.100	7.100
Output (A) - Median Years of Schooling (p.110)	9.300	10.600				12.100	
Ratio (A) - Output to Input	2.730	2.080				1.710	
Index (A) - 1950 = 100%	100.000	76.000				62.500 (-2.35% per year)	
Output (B) - School Enrollment in Millions (p.104)	31.300	45.200		54.300	58.000		
Population	152.000	180.700		197.000	201.200		
Output (B) - Per Capita School Attendance	.205	.248		.275	.288		
Ratio (B) - Output (B) to Input	6.000	4.900		4.200	4.120		
Index (B) - 1950 = 100%	100.000	82.000		71.000	69.000	(-2.55% per year)	

Page references from U.S. Bureau of the Census, *Statistical Abstract of the United States: 1970*. 91st Edition, Washington, D.C. 1970.

TABLE A-17
EXPENDITURES FOR PUBLIC ELEMENTARY AND
SECONDARY SCHOOLS IN MILLIONS OF DOLLARS

1957-58 TO 1970-71

(Current Dollars)

Year	Total	Current Expenditures	Capital Outlay	Interest on Long Term Debt	Current Ex- penditures for Elemen- tary/Secon- dary Day Schools	Percent Increase Biannual	Percent Increase Over 1957-58
1957-58	\$13,624.2	\$10,424.1	\$2,857.1	\$343.0	\$10,301.4		
1959-60	15,613.3	12,426.0	2,661.8	489.5	12,329.4	19.7	19.7
1961-62	18,373.3	14,923.4	2,862.2	587.8	14,729.3	19.5	43.0
1963-64	21,325.0	17,646.0	2,978.0	701.0	17,218.5	16.9	67.1
1965-66	26,248.0	21,701.6	3,754.9	791.6	21,053.3	22.3	104.4
1967-68	32,977.2	27,743.6	4,255.8	977.8	26,877.2	27.7	160.9
1968-69	35,511.2	29,842.1	4,654.1	1,015.0	28,644.9		178.1
1969-70	40,562.0	34,508.1	4,873.7	1,180.2	33,107.9	23.2	221.4
1970-71	44,423.9	38,026.2	5,061.4	1,336.3	36,453.6	27.3	253.9

Sources: U.S. Office of Education, *Statistics of State School Systems*. Current expenditures were converted to 1969-70 dollars on the basis of the Consumer Price Index prepared by the Bureau of Labor Statistics, U.S. Department of Labor.

TABLE A-18

EXPENDITURES OF REGULAR INSTITUTIONS,
BY INSTRUCTIONAL LEVEL AND INSTITUTIONAL CONTROL:
UNITED STATES, 1959-60 to 1979-80

(In billions of 1969-70 Dollars)

Year and Control	Total (all levels)	Elementary and Secondary Schools (Nonpublic School Expenditures are Estimated on the Basis of Expenditures per Teacher in Public Schools)				Institutions of Higher Education		
		Total	Current Expenditures	Capital Outlay	Interest	Total	Current Expenditures	Capital Outlay
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1959-60:								
Total	\$32.8	\$23.9	\$18.3	\$4.9	\$0.7	\$ 8.9	\$ 6.9	\$2.0
Public	26.1	21.1	16.2	4.3	.6	5.0	3.8	1.2
Nonpublic	6.7	2.8	2.1	.6	.1	3.9	3.1	.8
1964-65:								
Total	49.2	33.3	26.7	5.6	1.0	15.9	12.2	3.7
Public	38.1	29.2	23.4	4.9	.9	8.9	6.8	2.1
Nonpublic	11.1	4.1	3.3	.7	.1	7.0	5.4	1.6
1969-70:								
Total	70.3	45.4	38.4	5.7	1.3	24.9	21.3	3.6
Public	57.1	40.8	34.5	5.1	1.2	16.3	13.4	2.9
Nonpublic	13.2	4.6	3.9	.6	.1	8.6	7.9	.7
PROJECTED								
1974-75:								
Total	84.1	50.1	43.0	5.4	1.7	34.0	30.2	3.8
Public	67.6	45.2	38.8	4.9	1.5	22.4	10.7	2.7
Nonpublic	16.5	4.9	4.2	.5	.2	11.6	10.5	1.1
1979-80:								
Total	97.4	55.2	47.9	5.4	1.9	42.2	39.5	2.7
Public	78.4	49.7	43.1	4.9	1.7	28.7	26.4	2.3
Nonpublic	19.0	5.5	4.8	.5	.2	13.5	13.1	.4

Source: U.S. Office of Education, *Statistics of State School Systems*, 1970.

TABLE A-19

COST STRUCTURE FOR THE TYPICAL AMERICAN THIRD GRADE (DOLLARS PER STUDENT)

Resources Used	Functions of Expenditures								Resource Total	% of Grand Total
	Instruction	Physical Education	Recess	Lunch	Homeroom	Transportation	Principal & Staff Serv.	District Admin.		
Teacher	297.45	19.91	23.34	8.96	13.45				363.11	46.5
Classroom	104.94				4.74				109.68	14.0
Furn.	12.15				.55				12.70	1.6
Instructional Equip.	9.09								9.09	1.2
Books and AV Software	9.75								9.75	1.2
Multi-purpose Room		6.07		13.64					19.71	2.5
Kitchen				7.03					7.03	0.9
Multi-purpose Room Furn. and Equip.				3.13					3.13	0.4
Cafeteria Staff				13.87					13.87	1.8
Principal & Staff							83.54		83.54	10.7
Principal & Staff Offices							15.53		15.53	2.0
Principal & Staff Furn. & Equip.							1.88		1.88	0.2
District Admin. Staff								25.60	25.60	3.3
Admin. Offices								3.60	3.60	0.5
Admin. Furn & Equip.								.72	.72	0.1
Trans. Staff						12.15			12.15	1.5
Trans. Equip.						4.14			4.14	0.5
Other Supplies & Expenses	16.45			39.05		17.43	8.20	7.49	69.62	11.3
FUNCTION TOTAL	449.83	25.98	23.34	85.68	18.74	33.72	109.15	37.41	703.85	100.0
% OF GRAND TOTAL	57.4	3.3	3.0	10.9	2.4	4.3	13.9	4.8	100.00	

Source: Education Turnkey Systems, "Economics of Third Grade Education," *Audiovisual Instruction*, November, 1971.

TABLE A-20

TOTAL CURRENT FUND EXPENDITURES AND PERCENTAGES
DISTRIBUTION BY CATEGORIES, PUBLIC AND PRIVATE COLLEGES
AND UNIVERSITIES, SELECTED YEARS THROUGH 1966-67

Expenditure Category	1939-40		1955-56		1961-62		1966-67	
	Public	Private	Public	Private	Public	Private	Public	Private
Total Current Expenditures (millions of dollars)	328.0	346.0	1,960.0	1,565.0	3,968.0	3,222.0	8,224.0 ^a	5,837.0 ^a
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Educational and general	82.0	72.9	81.4	76.2	82.1	78.8	82.6	79.0
General administration	7.0	11.5	7.8	13.2	8.4	12.5	9.0	12.3
Instruction and departmental research	41.5	41.5	34.4	30.4	33.2	27.9	34.3	26.8
Libraries	2.7	3.0	2.4	2.6	2.5	2.5	3.0	2.9
Plant Operation	10.3	10.4	9.4	9.0	8.1	7.6	7.1	6.7
Extension	9.8	0.9	6.6	0.7	5.7	0.6	5.1	1.1
Related Activities	4.6	3.5	6.9	5.5	5.8	4.5	4.7	3.6
Organized Research	6.0	2.1	13.9	14.9	18.5	23.2	14.8	22.3
Other	...	...	...	...	...	...	4.7 ^c	3.3 ^c
Auxiliary Enterprises	15.9	20.8	16.9	19.7	15.9	16.5	14.3	15.2
Dining and Resident Halls	b	b	8.6	11.9	8.3	10.5	7.8	10.2
Other	b	b	8.3	7.8	7.6	5.9	6.5	5.0
Other Noneducational	2.1	6.3	1.6	4.1	2.0	4.7	3.1	5.8
Student Aid	b	b	1.6	4.1	2.0	4.7	3.1	5.8

^a Excludes current funds for physical plant assets.^b Not separately reported.^c Includes other sponsored activities, such as training institutes, as well as other unspecified expenditures.

Source: U.S. Office of Education, Biennial Survey.

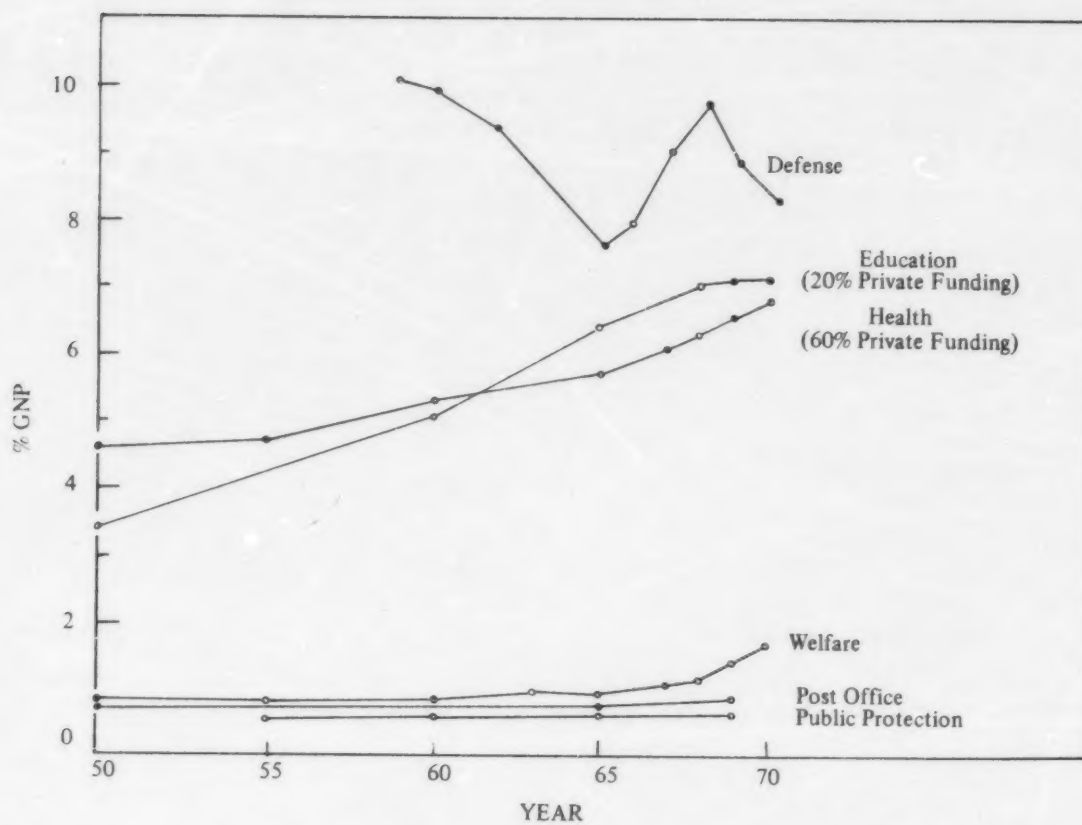


Fig. A-1: GROWTH IN PUBLIC SERVICE EXPENDITURES

Source: Morrow, W. E. Jr., The Relationship Between The Effectiveness of Public Service Expenditures And Research And Development (Unpublished Paper), 1971.

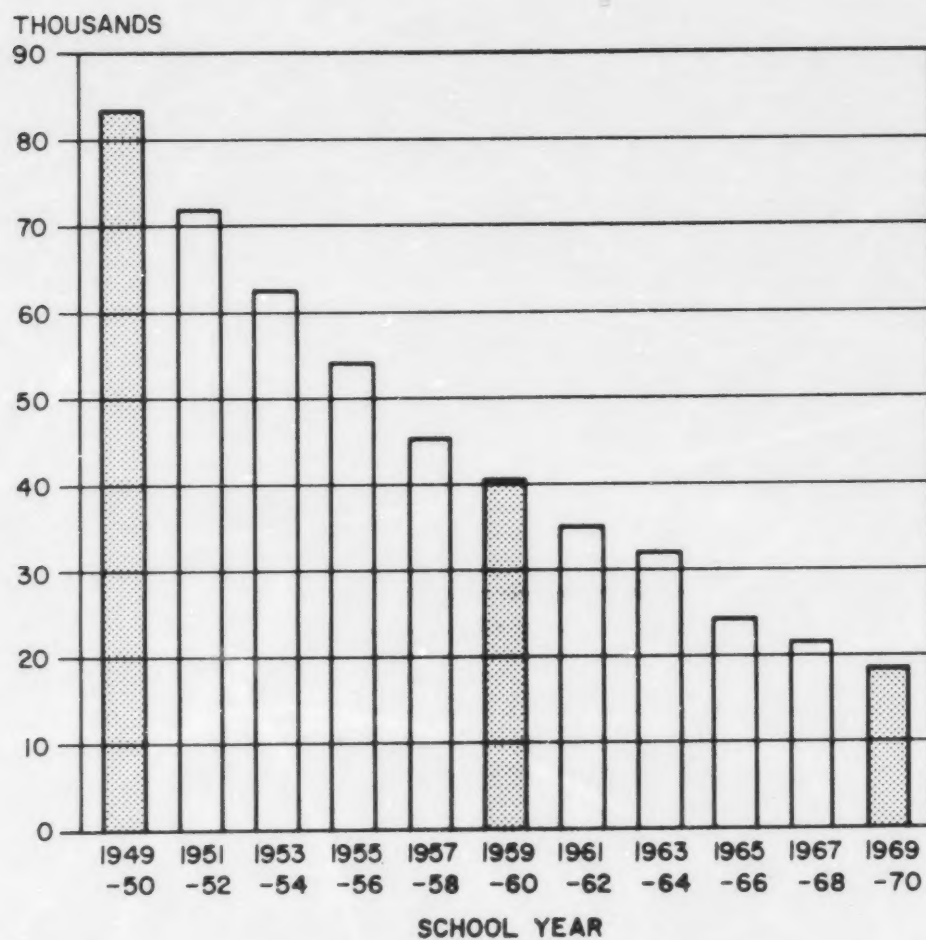


Fig. A-2: NUMBER OF PUBLIC SCHOOL DISTRICTS: UNITED STATES, 1949-50 to 1969-70.

Source: U. S. Department of Health, Education, and Welfare, Office of Education, *Digest of Educational Statistics* and *Fall 1969 Statistics of Public Schools*.

SCHOOL RETENTION RATES

FOR EVERY 10 PUPILS IN THE 5th GRADE IN FALL 1961



9.6 ENTERED THE 9th GRADE IN FALL 1965



8.6 ENTERED THE 11th GRADE IN FALL 1967



7.6 GRADUATED FROM HIGH SCHOOL IN 1969



4.5 ENTERED COLLEGE IN FALL 1969



2.2 ARE LIKELY TO EARN 4-YEAR DEGREES IN 1973



Fig. A-3: ESTIMATED RETENTION RATES, FIFTH GRADE THROUGH COLLEGE GRADUATION: UNITED STATES, 1961 TO 1973.

Source: U. S. Department of Health, Education, and Welfare, Office of Education, *Digest of Educational Statistics*, Table 10.

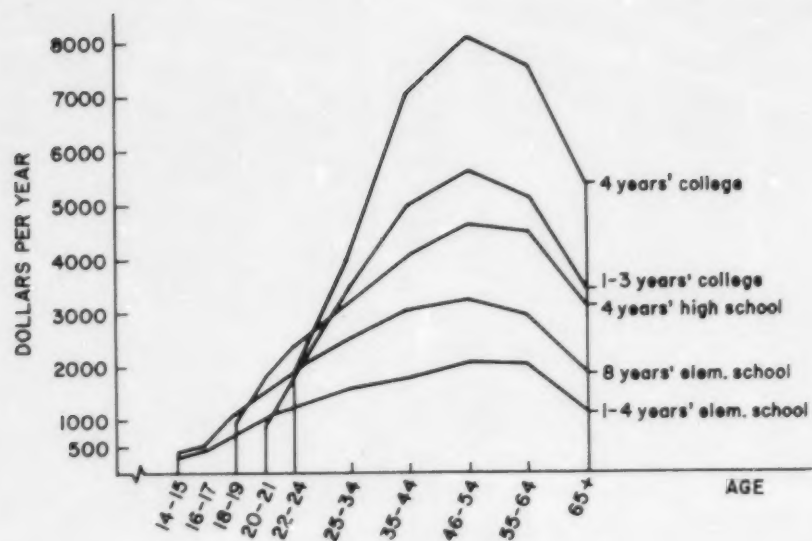


Fig. A-4: AGE-EARNING PROFILES FOR THE U. S. (1949).

Source: W. Lee Hansen (1963)

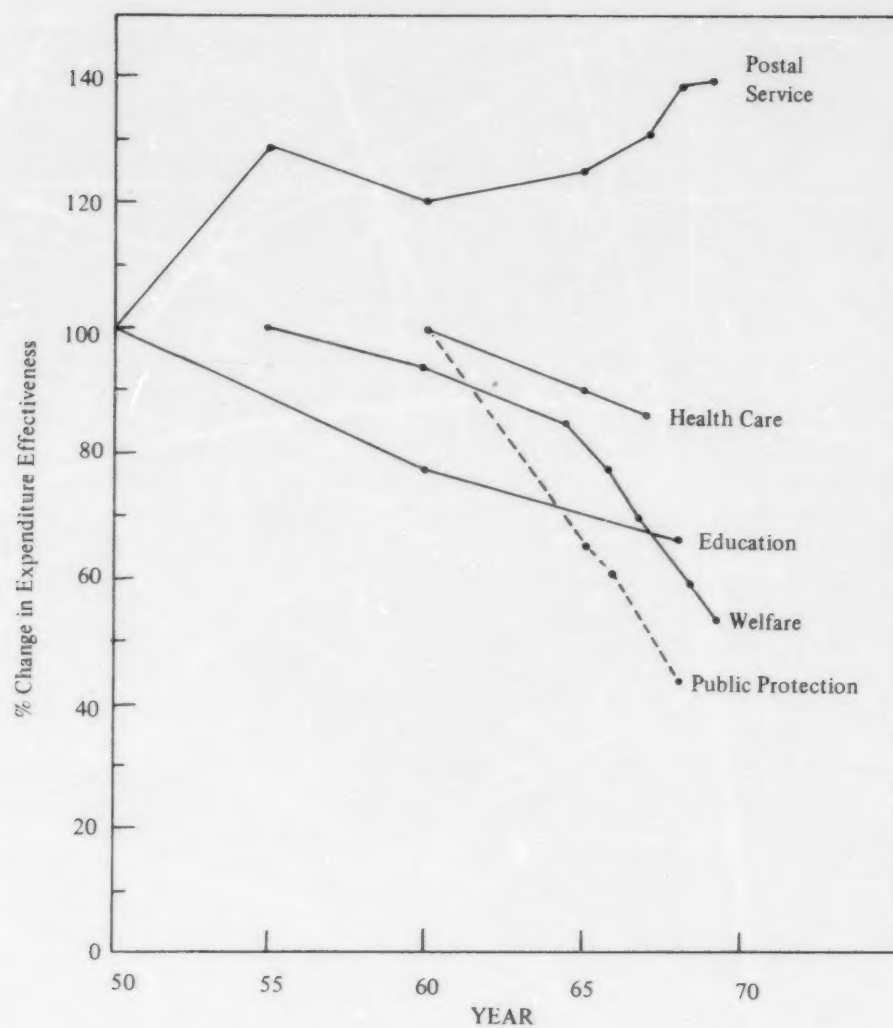


Fig. A-5. EXPENDITURE EFFECTIVENESS IN PUBLIC SERVICE

Source: Morrow, W. E., Jr., The Relationship Between The Effectiveness of Public Service Expenditures and Research and Development. Unpublished paper, 1971.

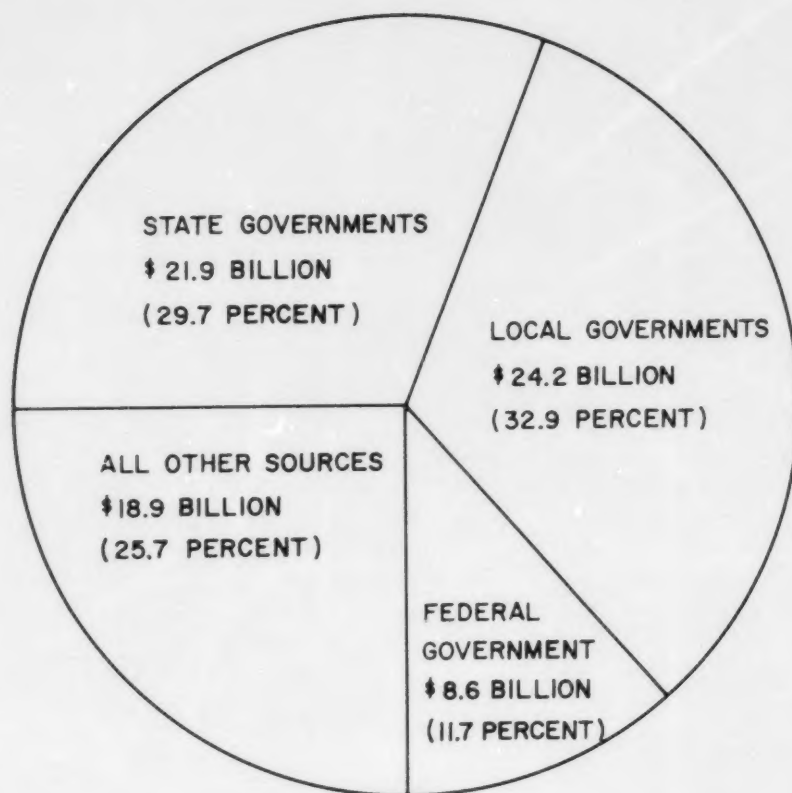


Fig. A-6: ESTIMATED EXPENDITURES OF EDUCATIONAL INSTITUTIONS, BY SOURCE OF FUNDS: UNITED STATES, 1970 - 71.

Note: Includes expenditures of public and private institutions at all levels of education from kindergarten through the graduate school.

Source: U. S. Office of Education, *Digest of Educational Statistics*, 1970.

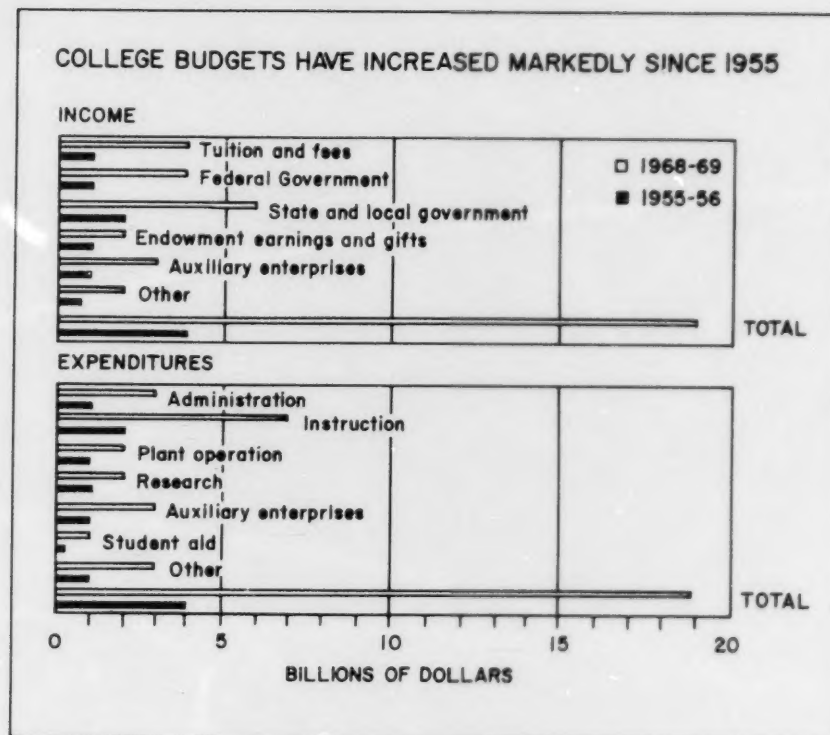


Fig. A-7: COLLEGE BUDGETS

Note: Current-fund operations only, capital projects not included. Auxiliary enterprises include dormitories, dining halls, faculty, housing, bookstores and the like.

Source: Morgan Guaranty Trust

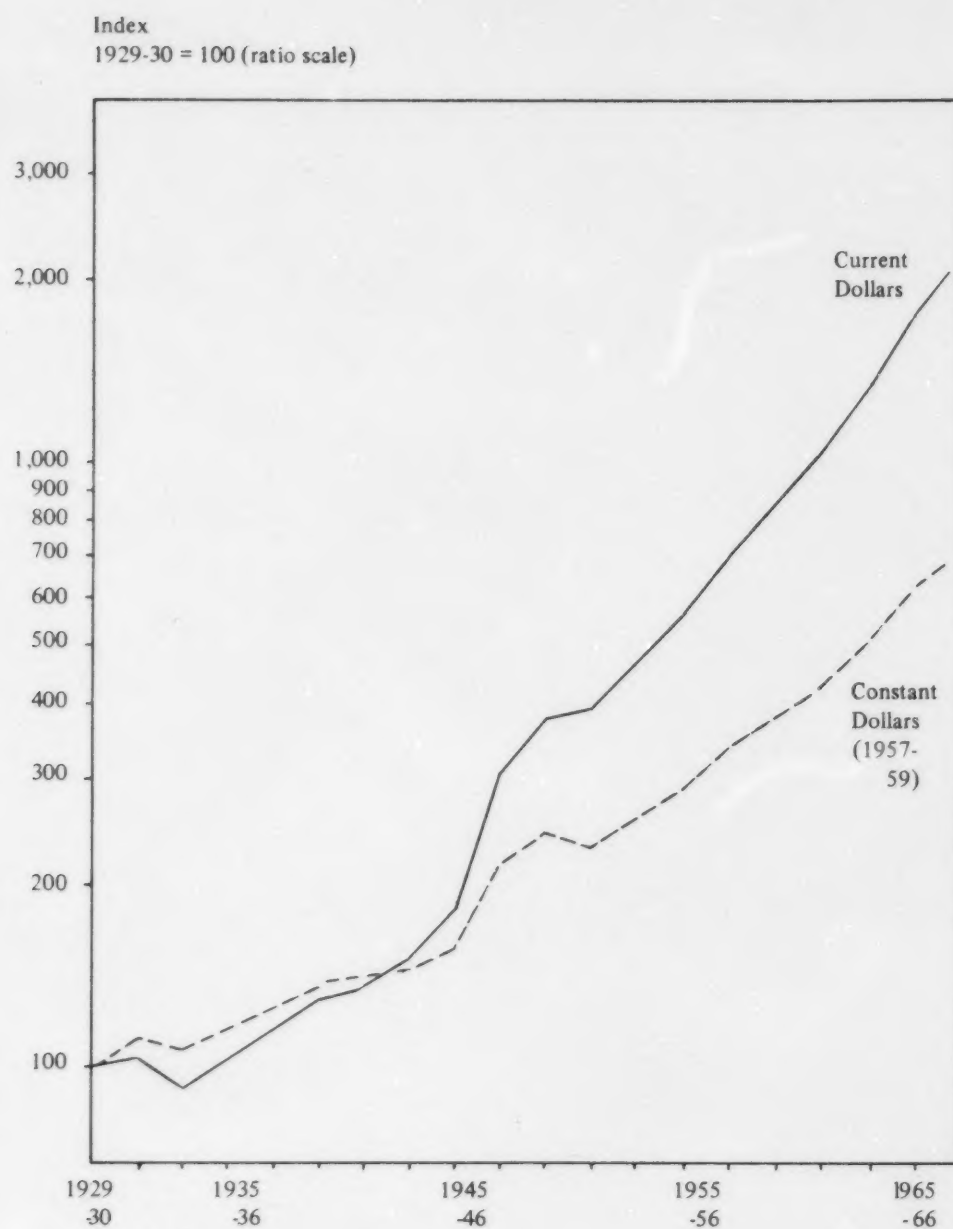


Fig. A-8. RISE IN COST OF HIGHER EDUCATION.

Source: Folger, John K., Helen S. Astin, and Alan E. Bayer, *Human Resources in Higher Education*, New York, Russell Sage Foundation, 1970.

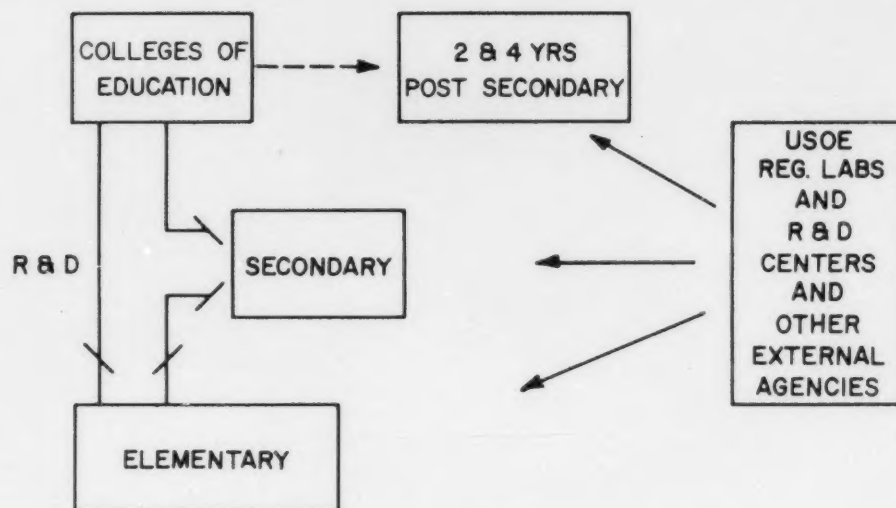


Fig. A-9: MECHANISMS FOR PERFORMANCE OF EDUCATIONAL RESEARCH AND DEVELOPMENT.

APPENDIX B

THE ROLE OF TECHNOLOGY

With the exception of the older technologies of printing and photography, the impact of technology on instruction has thus far been slight. The use of audio-visual aids, television, and computers in schools and colleges is steadily increasing, however, and several recent technological advances will surely find widespread educational use. Among these are the expanding growth of cable television systems, the rapidly decreasing costs and increasing availability of computers, the invention of computer time-sharing and interactive computation, the development or imminent developments of inexpensive microfiche readers, audio and video cassettes, picturephones, domestic satellite communications, and multi-computer networks.

These technological devices and systems can be used to provide new and powerful means for enhancing the value of instruction, increasing instructional availability and access, and improving use of instructional resources. They also provide substantial opportunities for expensive and ineffective applications. To guide the development of educationally valuable applications of technology, it is useful first to consider the different ways technology can be employed in education.

1. Technological Parts

Technology can be used to provide a communications medium for delivering instruction. Examples of such media are interactive television, microfiche sorters and readers, and computer systems. The educational value of a medium clearly depends upon how it is used in specific applications. The potential scope of a technological medium's use is often a great deal broader than is reflected in current practice. An educational medium is, however, only an aspect of an educational program or experience.

A second way of using technology is to help provide the objects of instruction. This may lie in the improvement of existing devices such as experimental equipment used in student laboratory work. It may, of course, provide the object of instruction directly. Thus, we may want to study photography as well as to use photographs for other purposes, and computers are

sometimes introduced into instruction in order to study computation. A third possibility is that the technology may serve to provide radically new operational facilities or conceptual frameworks for treating subjects of many kinds. Examples include the uses of computers in simulation and using programming languages as a framework for studying mathematics and problem-solving. These new "objects" are considerably closer to the curriculum than are the technological media. Though they do not in themselves completely define educational applications, they do open the way to a wide range of possibilities.

In addition to using technology to provide media or objects for instruction, we may use it to provide instructional design. Leading examples are the use of behavioral technology in providing principles and models for programmed instruction, computer-assisted instruction, and computer-managed instruction. Indeed, for some writers, educational technology means precisely this mode of use. For example, educational technology is

a systems approach to instruction, incorporating specific measurable instructional objectives, diagnostic testing, criteria for student performance (such as 90 percent of the students will attain 90 percent of the objectives), and the repeated redesign of the curriculum materials until the criteria are achieved (Grayson, Lawrence P. "Costs, Benefits, Effectiveness: Challenge to Educational Technology," *Science*, Vol. 4027, March 12, 1972).

This Skinnerian model of instruction is not the only one possible, though it is remarkably pervasive throughout the practice of traditional PI and CAI. The instructional model used in most of the "Sesame Street" presentations, for example, is very different. And it is likely that an increasing use of both advanced and relatively traditional technology will result in more varied curricular designs involving more diverse instructional methods, strategies, and models.

2. High Technology and Low Technology

When the subject of technological applications to

education is considered, the items on the following list are generally included:

- a. cable television
- b. closed-circuit television
- c. communications satellites
- d. film, film loops, video tape
- e. video and audio cassettes
- f. programmed instruction and special teaching machines
- g. language and reading laboratories
- h. PI, CMI, CAI
- i. picturephones
- j. multi-media devices
- k. minicomputers
- l. programming languages
- m. computer time-sharing
- n. information storage and retrieval
- o. multi-computer networks

This list is not given as a logical categorization or an exhaustive enumeration of technological devices or media. Rather, the striking thing it is intended to show is the emphasis on novelty, on relatively new or advanced technology.

Instead of using the term technology indiscriminately, it is useful to distinguish between "high" technology and "low" technology. High technology refers to those applications which arise at or near the front of technological advance. Computer mediated interactive television, such as in the MITRE TICCIT system, is an example of high technology. Cardboard carpentry, as developed at Education Development Center, is an example of low technology.

High technological developments typically emerge as candidates for educational application at a preliminary stage, as "bread-board" systems, and almost always have relatively high costs associated with subsequent development and initial use, as does anything in a laboratory phase. Thus, they can be tried at first only under special situations where high costs are tolerable. In carrying out high technology programs the objective is not immediate wide-scale dissemination and use, however. They serve rather as patterns for eventual use when their technological content has filtered down to ordinary practice and their costs have been reduced to acceptable levels. The developments that are carried forward during the initial laboratory phases of program operations often substantially enhance these filtering

and cost-reduction processes. It is important to recognize that the rate at which new technology is absorbed is constantly increasing. The lifetime between succeeding generations of computers, for example, is, by the most conservative estimates, under eight years at present.

The other level of development, low technology, is quite different both in means and in ends. It consists of a highly opportunistic approach to new materials and developments, usually with the objective of providing a widely needed device at a really low cost: the sort of technology that UNESCO applied to problems of underdeveloped countries (e.g., solar ovens, inexpensive water pumps, etc.). Examples at this level include the development of successively cheaper microfiche readers (at this point down to less than \$100), development of excellent laboratory equipment a magnitude lower in cost than before by the Physical Sciences Study Committee (PSSC), and the new presentation formats of "Sesame Street." Low technology can have an enormous impact on the current state of education. Its products, being inexpensive and replacing current materials or filling existing and recognized needs, can spread rapidly to the entire segment of education in which they are applicable. Such universality has been demonstrated in PSSC physics and "Sesame Street." It must be emphasized that these are "curricula" built around low technology—apparatus in one case and mode of presentation in the other—and not merely technological media, objects, or aids. The development of, say, a simple microfiche reader for \$10 or so would have profound immediate consequences.

Unfortunately, the nature of low technology development makes its pursuit unattractive in a number of ways. First, though it is easy to specify an area in which inquiry is to be made—elementary science, for example—it is difficult to predict with any certainty what specific products or innovations will be produced. These depend on opportunities that cannot be programmed in advance. Also, unlike advanced research projects which can be planned and organized with considerable detail and frequently administered like engineering projects with subtask specifications and schedules, application of low technology is fostered in a relatively informal setting through a large amount of interaction and exchange of knowledge. Thus, it is best to support centers of such activity, rather than work on a project basis, a mode of operation at variance with desired practice in most other areas of research. Finally,

although many new developments are eventually self-supporting, there is often considerable initial cost which is particularly hard to justify on a short-term basis because specific results cannot be promised.

3. Computer Technology

During the past ten years or so, investigators have started to program digital computers in special ways designed to provide an instructional interaction between a human and a machine. In one type of interaction, the machine serves essentially as a laboratory tool than can simulate physical experiments, mathematical demonstrations, etc., in such a way as to facilitate exploration and understanding of the process simulated. In another type of interaction, the machine directs a student in a tutorial dialogue, in reasonably natural language, in order to guide him toward solving a problem or learning a skill. Some results reported by these investigators presage the evolution of a new technology that may significantly augment the techniques of teaching and learning in many fields and at many levels of education and training.

Computers are used in at least two distinct kinds of instructional interactions with students. In one type of interaction, the computer is used to simulate a teacher in certain respects. The term computer-aided instruction has become virtually synonymous with this use of computers, which typifies most current instructional applications. To effect a teaching interaction with a student, the computer must be programmed to present a lesson. The program describing the lesson prescribes the manner in which the computer is to direct questions and give answers to the student during the course of their interaction.

This type of instructional interaction can be called a teacher-programmed interaction. Applications of this type employ a dialogue format that consists, at each step, of an input made by the student and an output made by the computer system, in either order. In some applications, the stated order (student, then system) is predominant throughout much of the interaction, and the student must take the initiative in receiving information from the system or in giving information to it. Such applications are, in essence, forms of programmed study. In other teacher-programmed applications, the inverse order (system, then student) predominates and the system takes the lead most of the time. These tutorial applications are the ones most frequently made, usually in the form of programmed drills and programmed lessons.

The other major type of instructional interaction, which can be called a student-programmed interaction, results when a student uses a computer freely, within broad limits determined by the versatility of the language used for communicating with the computer. This type of interaction is profoundly different, in that the student attempts to construct effective procedures for solving problems in his own way. He instructs the computer using one of several specially designed, relatively easy to learn, languages known as programming languages. Examples of such languages are FORTRAN, BASIC, and LOGO.

Work on computers and instruction thus far lies mostly in the phase of exploratory research and preliminary development. The work on teacher-programmed instruction has been carried out at several centers, the most active ones being the University of Illinois (the PLATO project), Stanford University, and Florida State University. Instructional research and teaching experiments with programming languages in a number of areas is being pursued at Massachusetts Institute of Technology, Syracuse University, Dartmouth College, and Bolt Beranek and Newman Inc., as well as other centers. Specific applications of both CAI and student programming in a number of subjects at both school and undergraduate levels are described and illustrated in *Educational Potentials of Computer Technology* (Wallace Feurzeig, BBN Report No. 1672, September 1968, prepared for the Kettering Foundation).

Recent continuing technological advances in computer design and use make computer applications to education more practical and compelling year by year. The advent of time-sharing has made feasible simultaneous, independent, interactive use of a computer by scores of persons. The introduction of minicomputers makes it likely that computers will eventually become widely available. Also, the new development of multi-computer networks can greatly facilitate the sharing of computer hardware, software, and courseware resources and enhance collaboration in development of instructional systems and applications. Intermediate between free-standing and mini-computers and massive multi-computer networks are large-scale time-shared educational facilities such as the PLATO or Dartmouth systems. Thus, services will be available in many different forms, each of which has certain advantages and special features and it is not likely that any single one will win out. Paralleling these advances in computer technology, a "second generation" of educational software-instructional systems, languages,

programs, and curricula—is beginning to emerge, of greater educational scope and depth than earlier derivatives of programmed instruction or computer programming.

Computers, like other new technologies, have had a dramatic decline in cost, and one might expect prices to level off during the next few years. A careful analysis, however, shows that the rate of decrease will even be sharper than it is at present. Computer costs can be broken down into the four categories of central processor, memory, terminal devices, and communications. Thus far, the decline in costs has been in the first two areas and, with the introduction of LSI technology and semiconductor, laser, and other new memories, we expect this decline to continue. Electromechanical terminals such as teletypewriter devices have, in fact, increased in cost to the point where they account for 25 to 30 percent of the cost of many time-shared computer systems and over half of their maintenance costs. The conversion to electronic terminals such as character terminals, plasma displays, and other such devices will provide great reductions in both acquisition and maintenance costs. Experiments in sharply reducing communication costs, such as the ARPA data communications network, have proved most successful and commercial exploitation of the technology acquired will certainly have a great effect. Thus, in the next few years all components of computer systems will have decreased substantially in cost. Furthermore, the end of this decline is not even discernible at present.

Computers are not yet a commonplace in education and each specific area of application (CAI, problem-solving, simulation, etc.) is centered at one or at most a few places. These centers function as a "cottage industry" (Molnar, Andrew R., "Critical Issues in Computer-Based Instruction," *Educational Technology*, August 1971). Each uses tools of its own devising to manufacture materials for local consumption. This leads to a very parochial view of computers; most educational users gain familiarity with only the one aspect of the field which happens to be available locally. Furthermore, the assessment of the value of each approach is hampered by the fact that the innovations are used mostly by a small circle of people close to the innovators. Also, the opportunity and motivation for developing educational materials really well integrated with the computer are small as compared to those found in other areas of educational development. This situation

must change as computers become cheaper and more widespread. A well-planned deliberate effort will be needed to design approaches and materials which fully realize the enormous educational potentials inherent in this technology.

4. Costs and Value Received

One simple expedient for nearly halving the total cost of education in America is by doubling the average student/teacher ratio. A really extreme possibility would be to present all instruction as lectures on (non-prime-time) network television. This might reduce the national expenditure for education by two or three orders of magnitude. These possibilities are never considered—the United States has a genuine commitment to improving the quality of education. One can cite the pattern of increasing expenditures per student or, more to the point, one can look at the steadily decreasing student/teacher ratio. (Such data are given in Appendix A.) The student/teacher ratio is a crude measure of the degree of personalization or individualization of the student/teacher interaction—that important aspect of education in which the teacher focuses on and guides the work of a single student.

It is true that some technological applications provide only auxiliary support; the cost-effectiveness of these can readily be measured by conventional differential methods. Many technological advances, however, bear directly on the individualization of instruction. Individualization does not mean merely that students work alone (a study hall provides this at very low cost) nor does it mean the presentation of a small number of alternatives. Individualization means the provision of an interactive environment with a great amount of feedback and student direction and guidance. (Two examples of such individualization—the Harvard Project Physics course and LOGO—are discussed briefly in the next section.) The trade-offs to be considered in evaluating the cost-effectiveness of these kinds of technologies, then, are not the incremental costs of their adoption but the ratio of these additional costs to the costs of achieving comparable individualization by other means (such as by reducing class size).

5. Technology and Educational Programs—Some Examples

Although the implications of technological application to an educational subject may be profound if

not central, the technological aspects encompass only some parts of the whole. It is true that a single technology such as computer science may provide all three aspects described above, by simultaneously creating the object of study, serving as the medium, and aiding in lesson design. Even in these extreme cases the specific instructional materials do not necessarily represent an educationally useful application of technology—a frame-oriented CAI system, for example, is still highly dependent on the quality of the material actually prepared. Such distinctions between various technological and nontechnological aspects of a given educational program are not merely Aristotelean exercises. Understanding the influence of a given technological innovation in a complete teaching situation is crucial for an evaluation of the innovation *per se*. That apparent success (or failure) of a given project can arise from factors not central to what one is testing is well known, but the formidable hardware so often encountered in high technology innovations often overwhelms the less sensational but often more central educational issues. A second and much more important reason for making distinctions between the various sorts of contributions is that careful matching of various technological and nontechnological parts can greatly enhance the project as a whole. An excellent example of this is the “Sesame Street” mode of presentation, which fits so very well in the medium of television. A much less careful matching is apparent in those interminable programs on educational television in which the lecture format has been lifted straight from the classroom without regard for communication medium. The Introductory Physical Science course developed by the PSSC is an example of how even unpredictable, serendipitous products of low technology can be coordinated and combined into a really excellent whole by the provision of carefully tailored teaching materials.

The impetus to the use of technology in education arises largely from general curricular needs and from consideration of new, specific, technological possibilities. The former arises from general educational viewpoints and the latter, dealing with future developments, is difficult to predict. We therefore give some case histories demonstrating successful applications of technology and examples of technological innovations on the verge of useful applications.

a. The Harvard Project Physics Course represents perhaps the broadest application of technology to any educational innovation and one of the most extensive

and thorough dissemination efforts to date. Development of the course was preceded by a careful modular design. A multimedia approach included use of 16mm films, single subject film loops, programmed instruction, and specially designed or adapted laboratory equipment. Subsequently, supplementary computer based materials were prepared, both of the frame-oriented CAI type and also for simulations. The modular, multi-path approach, combined with the wealth of media and materials, meant that no undue emphasis had to be placed on any specific form of presentation. This is very important in the low technological applications discussed above, such as preparation of film loops and laboratory equipment, where specific development successes cannot be guaranteed. This approach is, of course, excellent from a teaching point of view, since it allows for differences in student motivation and ability. The nontechnological aspects of HPP were at least as important as the technological ones. They included several types of textual materials, both for the student and teacher, standard tests and the several forms of dissemination including “barnstorming” and summer and in-service workshops.

b. The TICCIT system, developed at MITRE, represents the most advanced project in wide-scale interactive television using standard community television cables. Use of a central computer-mediated video system with a selective decoding-refreshing device on each home television set enables individual frames to be composed for, and addressed to, specific television sets, and, once there, to be maintained until replaced. Thus a single television channel can be split up in many different ways, depending on specific needs. For example, if a new frame is needed every ten seconds, ten channels can handle 6,000 different users. Feedback to the central station was provided by pushbutton telephones in a preliminary test, in Reston, Virginia, but designs exist for a keyboard in each home to be tied to the same cable serving the TV system. Eventual costs are estimated at \$.30 per hour, far below any existing interactive television system. TICCIT provides an example of a high technological application of very high quality with good prospects for rapidly filtering down and spreading. TICCIT, however, only provides a medium for education, and as such is sensitive in preliminary trials to the material it is used to present. This problem is particularly acute here because the special nature of TICCIT—the low computing power available and low frame transmission rate (for a situation

with many distinct users)—means that a close match between medium and materials is, at the same time, especially desirable and especially difficult. Under substantial National Science Foundation support, CAI courses are being written in junior college mathematics, English, and computer science to test and evaluate TICCIT in educational use.

c. Cardboard carpentry is one of the many low technological educational contributions of the Workshop for Learning Things, a former division of the Education Development Center. In this development, the need for an extremely inexpensive, versatile, and large-scale construction medium for the classroom was satisfied with the aid of special three-ply corrugated cardboard (trade name TRIWALL). Special wooden fasteners were developed and tape was also used for joining pieces. This cardboard is easily worked with hand-tools, and that, together with its considerable strength, makes it suitable for a wide range of classroom applications. As students (and teachers) acquire an "understanding" of this construction medium, their projects become more individual and more ambitious. Genuinely useful objects are built. A box or bookcase might be first projects and a more complex, demanding structure such as a full-sized (though admittedly non-permanent) working canoe a culmination of effort. By such means, problem-solving is presented as an activity bearing on real, concrete development. Dissemination is through teacher workshops in which teachers go through the same process of gradual development as their students will.

d. LOGO is the name of a new programming language developed at Bolt Beranek and Newman and

expressly designed for teaching the concepts and skills of formal and heuristic thinking. The intention of the design was to make possible the use of programming concepts and activity as the central conceptual framework for new presentations of mathematics, computer science, and large parts of psychology and linguistics. The LOGO language provides students with a rich set of primitive operations with which they gradually build extended complex program structures. The building of these structures is greatly facilitated by procedure-oriented program forms and by the use of recursion. LOGO is easily learned—its syntax fosters the writing of relatively compact and very readable programs, and it has powerful facilities for debugging and editing.

In use, LOGO programs become the vehicle for introducing and developing the major concepts to be taught. In mathematics, concepts like number, function, equation, strategy, representation, algorithm, and the like are expressed as LOGO programs. Moreover, such concepts are used and extended in a variety of student programming projects. This kind of course is radically different from the familiar programming or computer laboratory course where student programs are written merely to augment the conventional classroom lecture-discussion presentation. Preliminary work on integrating LOGO into curricular materials has been supported by the National Science Foundation. LOGO has been used in teaching experiments on student populations ranging from third grade to undergraduates. The work is currently at the stage where wide-scale testing is appropriate.

APPENDIX C

A PROGRAM IN THE AREA OF PRODUCTIVITY: THE UNBUNDLING OF HIGHER EDUCATION

Institutions of higher education perform several different functions tied together in one package and offered to students on a take-it-or-leave-it basis. This kind of organization probably aggravates the tendency of institutions to resist the introduction of technology or other innovative practices that might be more cost effective for the individual clients. Further, furnishing to all students services unneeded and undesired by some and requiring all students to pay for them appears wasteful of both institutional and student resources. The program proposed here is designed to show the feasibility of unbundling the educational services provided by colleges and universities. It is anticipated that, when this is done, an increase in productivity will follow.

Colleges and universities serve a variety of functions. Among the most important are:

1. An *educative* function, by imparting information to students and by instructing them in the skills and methodologies appropriate to the discipline or profession in which they are interested.
2. A *credentialing* function, by certifying educational attainment through the awarding of degrees.
3. A *distributive* function, by attempting to match students with schools and programs appropriate to their interests and abilities.
4. A *social* function, by providing the student with an institutional context with which he can identify.
5. A *role-model* function, by providing the student with opportunities to interact with individuals who enjoy high-status academic occupations.

These functions vary in importance and value to different students. At present, a student who wants just one service or wants selected portions purveyed by different institutions through variable periods of time cannot purchase what he needs. Courses are packaged into credit hours, credit hours are packaged into curriculum, final examinations follow fixed schedules,

specific substance is conveyed through one specific medium without the possibility of choosing one's own mode of instruction.

These practices have evolved to meet the needs of the majority of what used to be higher education's clientele; namely, the sons of the upper and upper-middle classes and, in the last few decades, youth seeking upward mobility through academic achievement. No doubt these students, by and large, found suitable the four-year seclusion of college study that prepared them for desirable social and economic roles. But with burgeoning enrollments has come a more diversified population with varying needs and desires for some, though not necessarily all, of the standard components of higher education. Traditional "requirements" for graduation may be unsuited; time and site may not be convenient for the student who wants (or needs) to work while studying; he may be uninterested in "campus life," finding his home community more authentic; he may wish to take instruction from selected professors at different institutions or work independently under an advisory system, etc. But opportunities for choice are very limited; generally, a student enrolled in an institution has to pay for all the services offered by the institution, whether or not he wishes or is able to make use of them.

1. Specific Objectives

The program proposed here is designed to meet the following objectives:

- a. A plan will be developed and implemented to demonstrate the feasibility of separating into discrete "industries" (both profit and non-profit) a variety of educational services.
- b. Specific unbundled services will be developed incrementally until they can compete successfully with the traditional total-package arrangement.

Parallel with the creation of such unbundled educational industries, fiscal plans will be developed enabling students to avail themselves of the offered services.

2. The Proposed Plan

a. The Educative Function. Portions of this component already exist in the form of the current knowledge industry. Additional investments, particularly seed money, will probably be needed in such areas as the production of model courses via interactive cable TV, educational video cassettes, and computer terminals. Insofar as possible, courses should be self-contained and independent of specific sites of instruction. For the natural sciences, this will involve the ingenious design of laboratory experiences, conceivably modeled on the British Open University home experiment kits. It would appear that this function can be largely performed by the private sector, once profit potential is demonstrated.

b. The Credentialing Function. Credentialing agencies could be developed to fill several functions: test-drafting, test-making, credit and degree awarding, grading, and perhaps assigning performance-oriented tasks (writing of papers, experimental investigations, developing a piece of curriculum in the case of a prospective teacher, financial analysis of a development project for a future economist, etc.). Choices of grading systems should be available to students. Agencies could award diplomas both on the basis of their own grades and on those of other firms. Competing agencies, some perhaps profit-oriented, should be encouraged. If choice is available, quality should be regulated by the market place; e.g., chemists certified by The American Chemical Society might be preferred for industrial or academic employment over graduates with chemistry majors from an undistinguished institution.

c. The Distributive Function. Agencies other than colleges and universities that could carry out a distributive education function would be a fairly new phenomenon in the U. S. (It is not unknown elsewhere: for instance, a network of counseling and tutoring services exists in the Soviet Union for correspondence students.) Different types of advice might be purchasable: how to put together for oneself a specific package aimed at some career or avocational goal; intensive tutoring with choices of the type of tutoring desired (human one-to-one interaction, technologically mediated drill-and-practice); pacing for students who are not highly self-motivated through a system of fines, forfeits, and dunning. That this kind of service can be profitable has already been demonstrated by the increasing business for college placement agencies and the informal, but highly effective, tutoring and

information services (ratings of teachers and courses) developed by students, for students, on many campuses. Clearly, however, the range of services and their availability need to be expanded.

d. The Social Function. Investment of Federal funds to duplicate this function does not appear appropriate. Students are likely to form their own aggregations, perhaps around tutoring centers, perhaps in areas unconnected with their academic activities (e.g., Woodstock, Fort Lauderdale, community action groups). Also, those students who highly value exclusivity and social connections would continue to go to high-status institutions, being willing to purchase the package in order to gain these benefits.

e. The Role-Model Function. A system of supported internships in industry and the non-profit service sector (public institutions, government, social service agencies) will allow experience with a much broader range of occupations than are modeled in institutions of higher education. Initial Federal funding of internships may demonstrate their usefulness to both student and employer so that they may become self-supporting. Responsibility on the part of practitioners and job holders for apprenticeship education, already accepted by the medical, research, and skilled labor professions, will also be encouraged through such an initiative.

f. Student Support. Existing schemes for student support will have to be adapted to allow poor students equal access to the variety of services. Perhaps individuals could be allocated a specific amount of money, duplicating current support available for a college education, to be spent at the individual's discretion for educational services. Presumably, he would try to "buy the most for his money." This would not only allow many more options for students now in a position to go to college, but would make it feasible for poor individuals to obtain higher education, even if they need to work while doing it, or are not within commuting distance of an inexpensive (or free) city or state university.

g. Evaluation. As an appreciable number of students avail themselves of the services to be offered, comparative studies of outcomes need to be made. Components to be examined would include costs, career success (both obtaining desirable jobs and performance in those jobs), academic attainment, social and

psychological effects on the individual and family, etc.

3. NIE Priorities

The purpose of this set of activities is to introduce greater flexibility and productivity into the system of higher education. It is expected that, even if competing services become viable, many institutions will continue to function much as they do now, since their packaging will be so good as to attract a sizeable number of students who prefer them to unbundled higher education. Clearly, NIE cannot simultaneously undertake the full range of activities necessary to make separated educational services available to all students as an alternative to existing institutions of higher education. Hence, a time-sequenced series of activities would need to be initiated in order to build the crucial components over a period of years.

a. Unless credentialing mechanisms could be made available, assuring a student credit (grades, course credits, degrees, etc.), for achievement and performance at least equivalent to that obtainable through traditional means, he would not be in a position to choose alternative forms of instruction. Hence, the extension of external credentialing is one of the first activities NIE might have to support. Existing agencies could be funded to expand their current programs, for instance the college level examination program sponsored by ETS; the effort by New York State through the Regents External Degree Program; evaluation mechanisms being developed by University-Without-Walls based on performance criteria; and explorations by community-oriented state colleges on how to award credits for "life experience."

Future steps in this area could include identification of other agencies that would be likely candidates to develop proficiency tests and stimulate their entry into the field. Examples are professional societies; high school equivalency examination boards; testing agencies such as the Psychological Corporation; and industrial corporations already using test mechanisms for internal decision-making.

It may be anticipated that, at first, any expansion in testing and evaluation activities would be through existing institutions of higher education, as is true of the College Level Entrance Program (CLEP) now. As other components of an unbundled system were strengthened, however, the credentialing agencies could be expected to

become autonomous in their operations, offering their services either through other institutions or directly to the student himself.

b. The student would need access to alternatives for acquiring knowledge. A two-pronged support program by NIE might be called for here:

1) Development of additional curricular materials which could be studied independent of institutional setting:

a) Introductory courses developed by professional societies (text, correspondence homework and quizzes, tutorial guidelines for tutor-centers at local universities or community centers) to meet the requirements of their proficiency exams.

b) Extension of the University-of-the-Air to cable television at three to six sites with existing installations. For the present, the courses should be developed with the cooperation of local universities who might be willing to give credit. Market surveys should be used to establish the most highly desired courses, optimal times for broadcasting to the home, and projected enrollments.

c) Cooperative efforts between institutions of higher education and industrial concerns to design specialized portable courses to be offered at plant sites, in homes, at community centers, as well as on campus, and which would lead to an upgrading of employment.

2) Many channels of education may be already available in a community, but the student would need help in identifying these and putting them together in appropriate ways:

a) Creation of inventories of learning resources. The University-Without-Walls is already developing such centers in embryonic form at each of the sites where it is operating. Such inventories could be constructed for several local situations, but also at a broader level of use.

b. Advisory system for students not formally attached to specific institutions. Early foci for the establishment of these are the

teacher-advisor networks already being set up by a number of experimental colleges, and the informal student advisory services existing on many large campuses.

c. NIE might fund a limited number of internships for individuals engaged in study at the undergraduate level. Enough sites could be supported (20 to 50) to represent a large variety of careers and types of institutions, both private and public. Federal funds might be used to subsidize part of the interns' salaries and provide released time of permanent staff for supervision and training.

d. Studies might be funded to develop support mechanisms for students wishing to take advantage of a variety of educational and credentialing components. Two particularly promising possibilities are:

1) Credit banks for four years of higher education allowing drawing rights by individuals as they perceive the need for specific kinds of education and credentialing. The government could, for instance, guarantee each citizen 15 years of free education, but with no particular specification as to how and when the "education credits" were to be used. Presumably,

trustees (parents or guardians) would be using available vouchers for an individual's early education, but at age 18 (or preferably even earlier, say, at age 15) the individual himself might decide what use to make of the educational funding available to him. Clearly, detailed feasibility studies and development of fiscal support plans are necessary before such schemes can be evaluated and tried out.

2) Full funding of higher education. In the case of this mechanism, a variety of proposals have already been worked out in some detail (Weisbrod and Hansen for the State of Wisconsin; Armacost *et al*, for the State of Kansas; Singell, Schrock and Yordan in a general scheme using the Federal income tax system for repayment of long-term loans, etc.). NIE might support evaluation of the various schemes for feasibility of early implementation, and subsequently support their testing out in several sites (number depending on readiness and size of geographic subunit, e.g., individual institution, state-wide system, all institutions in a metropolitan area, etc.). While first trials of full-funding schemes are likely to be institution-centered, such mechanisms, if successful, will clearly advance the fiscal power of the individual buyer in a diversified and competitive educational marketplace.

APPENDIX D

DEFINITION OF BASIC EFFICIENCY AND PRODUCTIVITY CONCEPTS

1. Efficiency

Assume that a school system is producing a vector $Y = (y_1, y_2, \dots, y_m)$ of outputs, where y_i represents the amount of the i th output produced (For output theory relating to the educational system, see Rivlin, 1971).

Assume that in order to produce Y the system uses a vector of resources $X = (x_1, x_2, \dots, x_n)$ and that the price that must be paid for a unit of the j th resource is p_j . The mathematical representation of the process by which the inputs are used to obtain the outputs is called a production function by economists. In order to discuss efficiency the existence of a production function f such that $Y = f(X)$ is assumed. The costs, C , of producing Y

by using input mix X is clearly given by $C = \sum_{j=1}^n p_j x_j$. If the

same output vector could be produced using a less costly input vector, (i.e., if there existed an $X' = (x'_1, x'_2, \dots, x'_n)$

such that $Y = f(X')$ and $\sum_{j=1}^n p_j x'_j < C$) then the school

system will be said to be internally inefficient. If there is no input vector less costly than the one in use, the system is internally efficient. Clearly, the efficient input combination(s) will depend on p_j unless f is of a peculiar form indeed. Thus, marked changes in relative input prices that are unaccompanied by corresponding changes in relative factor inputs would lead one to expect internal inefficiency.

2. Productivity

Productivity, like efficiency, is a concept related to the amount of output one gets from the inputs to a production process. A thorough overview of productivity theory may be found in Nadiri (1970), but we will review a few basic concepts here. Consider a man whose task is to fill sandbags and who works X hours per day five days a week. Let his output, Y , be the number of sandbags he fills per week. His productivity is the amount of output he produces per unit— Y/X . In this case one would expect Y/X to decrease as X increases because the worker will shovel more slowly as he tires.

In the above example the concept of real output per unit of real input is very clear. In general, however, there will be more than one input in the production process: $Y = f(x_1, x_2, \dots)$. If so, the concept of real input

is somewhat unclear; how does one add teachers and classroom space, for example. It is still possible to define partial productivity indices of the form Y/X_1 , Y/X_2 , etc. However, Y/X_1 is very likely to increase as X_2 increases without any change in some intuitive notion of real productivity. For this reason economists have found it useful to define a total factor productivity index equal to $Y/(\sum W_i X_i)$, where the W_i 's are the weighting factors that enable us to say how many square feet of classroom space constitutes the same amount of real input as one teacher, etc.

To make this approach operational one must have a mechanism for choosing the weights, and the W_i 's are usually taken to be the prices of the inputs at some point in time. A difficulty with this is that if one wishes to make intertemporal or interregional comparisons of productivity, relative prices may differ at the different times or in the different places. Different systems of relative prices can give quite different answers concerning the relative productivity of two systems and, if this happens, there is simply no one "correct" answer. This problem is particularly troublesome in the case of education since the price (wage) of a teacher tends to vary more across time and regions than does, for instance, price of classroom space.

It is important to keep clear the distinction between internal efficiency and productivity. Two systems can both be efficient in terms of their own production functions and the prices they face, while one is much more productive than the other. It is quite possible for an internally efficient system to be less productive than an inefficient one. The important difference is that an internally inefficient system can always improve its productivity. It is also important to note that increasing the cost (over time) of producing the same level of output does not necessarily imply a decrease in internal efficiency or productivity. If a school system has the same number of schools, teachers, and graduates this year as ten years ago, its productivity is unchanged (assuming output equals the number of graduates and the only inputs are teachers and schools). Nevertheless, due to rises in teacher salaries, the cost per graduate will have increased relative to other prices in the economy. Another way of stating this is that while reducing teacher salaries might reduce costs per graduate it would not thereby increase the productivity of the schools.

APPENDIX E

RESULTS OF SCHOOL PRODUCTION FUNCTION STUDIES

This appendix consists of a table describing the effects of teacher and school variables on educational attainment and constitutes a reasonably up-to-date review of that literature. The letter footnotes describe

some of the studies in a very summary way; the numerical references are keys to a special bibliography at the end of this appendix.

EFFECTS OF TEACHER AND SCHOOL VARIABLES

	Statistically Significant	Statistically Insignificant
Teacher Verbal Ability	a. Adelman (1) b. Bowles (7) c. Bowles & Levin (6) d. Guthrie (15) e. Hanushek (16) f. Hanushek (18) White-manual h. Michelson (30) Whites, single equation	f. Hanushek (18) White, non-manual Mexican American- manual g. Levin (27) Michelson (30) Whites, simultane- ous; Blacks, single equation
Teacher Experience	Adelman (1) (Multiplier effect thru simultaneous equations) i. Burkhead (9) Small community or 12th grade reading score Hanushek (16) j. Katzman (21) for reading score only (1 of 6 outputs)	Burkhead (9) Chicago Bowles (7) Guthrie (15) 2 of 30 regres- sions Hanushek (18) all groups for all other outputs k. Kiesling (23)

	Statistically Significant	Statistically Insignificant
	Levin (27) Michelson (30) white, single equation; white, simul- taneous l. Thomas (36)	Michelson (30) black, single equation
Teacher Salary	m. Benson (4) 1. for all district sizes for upper quartile 2. Small district for mean salary Bowles & Levin (6) Burkhead (9) Atlanta, dropout rate. Small comm., 12th grade reading. n. Cohn (10) Kiesling (23) For urban schools, math gain o. Raymond (34) Thomas (36)	Bowles Burkhead (9) Atlanta, verbal & other outputs. Small, other outputs.
Per Pupil Expenditure	Benson (4) for small districts only (instructional exp.) Burkhead (9) Chicago, dropout Atlanta, dropout Small, Comm. Reading test only. p. Kiesling (22) for 4, 5 & 6 for all occupations Kiesling (23) urban schools, math gains Thomas (36)	Burkhead (9) (Chicago, Achieve- ment tests & 4 other outputs.) (Atlanta, Achieve- ment tests & 2 other outputs.) (Small comm. Current exp. & 2 other outputs.) Kiesling (22) for higher grades Levin (27) (on books) Raymond (34) current

	Statistically Significant	Statistically Insignificant
Class Size (Average)	Adelman (1) q. Mollenkopf (32) Thomas (36)	Cohn (10)
Pupil-Teacher Ratio		Benson (4) Bowles (7) Burkhead (9) Atlanta Katzman (21) Kiesling (23) Raymond (34)
ADA	Benson (4) for medium size district	Burkhead (9) Chicago, Atlanta & small comm. Cohn (10) Katzman (21) Kiesling (22) Kiesling (23)
Teacher Major	Adelman (1) (if teacher majored in educ.)	Levin (27) Michelson (30) Bowles (7)
Teacher (Higher Degree)	Katzman (21) Math score only.	Burkhead (9) (MA & higher) Chicago Hanushek (18) (graduate units) All groups Katzman (21) other 5 outputs.
Teacher Certification	Katzman (21) math Latin application	Burkhead (9) Katzman (21) other 4 outputs Kiesling (23)
Teacher Turnover	Katzman (21) attendance math	Katzman (21) other 4 outputs Levin (27) Michelson (30)

	Statistically Significant	Statistically Insignificant
Teacher Attitude	Guthrie (15) 23 of 30 regressions Michelson (30) white, single equation	Levin (27) Michelson (30) white, simul- taneous; black, single equation
Teacher (Year Since Recent Educational Experience)	Hanushek (18) white, manual; white, non- manual	Hanushek (18) Mexican American, manual
Teacher Experience with SES Class	Hanushek (18) white, non manual	Hanushek (18) white, manual; Mexican American, manual

NOTES

- a. Adelman
 Data: Sixth grade students in 369 schools using Coleman data; school averages for all variables; use simultaneous equations.
 Output: Sixth grade verbal achievement.
 Significant: Verbal ability, teacher experience, class size, teacher major.
- b. Bowles
 Data: Twelfth grade black students using Coleman data using school average; 3 linear regressions.
 Output: Twelfth grade verbal.
 Significant: Teacher verbal ability.
 Insignificant: Teacher experience, teacher salary, pupil-teacher ratio, teacher major.
- c. Bowles & Levin
 Data: Twelfth grade black students using Coleman data on school average basis; 1 linear regression.
 Output: Twelfth grade verbal.
 Significant: Teacher verbal ability, teacher salary, science lab facilities.
- d. Guthrie, *et al*
 Data: 52 school districts using Michigan data; 89 schools, 1,300 teachers, 14 districts, 5,284 students using Coleman data.
 Method: Simple correlation after stratified into SES decile; 30 regressions per school variable.
 Outputs: Verbal, math, and reading score.
 Significant: Teacher verbal ability, teacher attitude, building age.
 Insignificant: Teacher experience, library volumes.

- e. Hanushek
- Data: Sixth grade students in Northeast and Great Lakes Region using Coleman data. School averages are used for output and input.
- Method: Stratified by race; multiplicative models used with OLS.
- Output: Verbal score.
- Significant: Teacher verbal, teacher experience.
- f. Hanushek
- Data: 1,061 third grade students in one California school district; students were matched with their teachers.
- Method: Linear regression of 3 groups [1. White, father manual laborer.(515); 2. White, non-manual (323); 3. Mexican-American, manual (140)].
- Output: Third grade verbal score.
- Significant: Teacher verbal; teacher experience with SES class; years since teachers' most recent attendance in some educational institution; (for some groups).
- Insignificant: (Above 3 for some groups); teacher experience; number of graduate units teacher had.
- g. Levin
- Data: 597 white sixth grade students in Eastmet using Coleman data; average school resources and average 3rd-5th grade teacher characteristics applied to students on an individual basis.
- Method: Use OLS, TSLS and reduced form to estimate system of simultaneous equations; (no tests of significance for reduced form).
- Output: Sixth grade verbal (only output included in table); (other outputs in article summary); grade aspiration; student attitude, parent attitude.
- Significant: (TSLS only) Teacher experience; teacher undergraduate institution.
- Insignificant: Teacher verbal score; teacher satisfaction with school; teacher turnover; library volumes per student.
- h. Michelson
- Data: 597 white sixth grade and 458 black sixth grade students in Eastmet who attended one school using Coleman data. School inputs averaged and third and fifth grade teacher attributes averaged and applied to students on individual basis.
- Method: Stratified by race; single equation OLS for achievement outputs with different input combinations; simultaneous equation for whites and blacks using TSLS and reduced form but tests of significance for white TSLS only.
- Output: Sixth grade verbal (only output reported in table, for other see Article Summary); sixth grade reading, sixth grade math; student attitude; student grade aspiration.
- Significant: Teacher verbal; teacher experience; teacher attitude.
- Insignificant: (Above 3 for some groups); teacher turnover; teacher major.
- i. Burkhead, *et al*
- Data: 39 Chicago H.S.; 22 Atlanta H.S.; 206 small community high schools (Project TALENT Data); SES data from Census Bureau.
- Method: Separate regressions for each group using a step-wise regression with a specified order of inputs.

Output: Chicago

1. Percent 11th grade in top 60% I.Q. range;
Percent 11th grade in normal group for same range;
2. Same index for reading test;
3. Percent dropout (11th grade)
4. Percent 11th grade with college intention;
- 5.&6. Residuals on first two outputs after controlling for 9th grade I.Q.

Atlanta

1. School median on 10th grade verbal.
2. Percent male dropout, all grades.
3. Percent graduates who went to college.
4. Residual for 1. controlling for 8th grade score.

Small Community

1. Mean 12th grade reading;
2. Percent male dropout, all grades;
3. Percent graduates who went to college;
4. Residual for 1. after control for 10th grade score.

Significant: Teacher experience; teacher salary; per-pupil expenditure.
Insignificant: (3 above inputs for some groups); pupil-teacher ratio; ADA; percent teachers with MA.

j. Katzman

Data: On a district basis for 56 school districts in Boston.
Method: Linear regression on all outputs; step-wise regression to find best linear and best multiplicative model for all outputs: (if variable was significant best linear and OLS had same regression coeff.)

Output:

1. ADA
2. Rate of continuation through H. S.
3. Gain in median reading, 2nd to 6th grade.
4. Median math grade for 5th grade.
5. Percent taking exam (application) for special (Latin) H. S.
6. Percent passing exam.

Significant: Teacher experience; teacher higher degree; teacher turnover; teacher certification.
Insignificant: (all of above); ADA; pupil-teacher ratio.

k. Kiesling

Data: 97 school districts in New York; 4th graders tested for 3 consecutive years.
Method: Stratified on occupation of breadwinner and urban/non-urban; also uses three variations of three outputs; total of 108 regressions (reports nothing significant for non-urban and uses only a few tables for urban; math gain for urban had most significant variables and this is the only one included).

Output: Math gain, urban (since regressions run on stratified basis table contains 6 values for all pupils or range; see article summary for more details).

Significant: Teacher salary; per pupil expenditure.
Insignificant: Teacher Certification, ADA; pupil-teacher ratio, teacher experience.

l. Thomas

Data: 206 schools in communities with 2,500-25,000 population using Project TALENT data; SES data from Census.
Method: Step-wise regression using all inputs for each output; 18 regressions.
Output: (See article summary).
Significant: (Those variables which consistently appeared) Median salary; expenditure per pupil; average class size; number of library books; age of building; teacher experience.

- m. Benson
- Data: District level data for 392 school districts SES data from Census.
- Method: Stratify by size of district (2000; 2000-4500; 4500) and then uses step-wise regression; also stratified by achievement score; I.Q.; and SES (but no tests of significance).
- Output: Fifth grade median reading.
- Significant: Teacher salary; per-pupil expenditure; ADA.
- Insignificant: ADA; pupil-teacher ratio.
- n. Cohn
- Data: 377 school districts in Iowa; in SES data.
- Method: OLS for linear and multiplicative models.
- Output: Twelfth grade—tenth grade score on Iowa test.
- Significant: Teacher salary.
- o. Raymond
- Data: 5,000 students who entered W. Va. University. Match students with their elementary school district; SES data from Census.
- Method: OLS (4 regressions on each output using various input combinations).
- Output:
1. Freshman GPA.
 2. Composite Achievement Test.
- Significant: Teacher salary.
- Insignificant: Student-teacher ratio; current expenditure per pupil; number library books in excess of standard.
- p. Kiesling
- Data: 97 school districts (similar to above Kiesling study) (This study includes more grades but less inputs).
- Method: Stratification by occupation of breadwinner and then linear regressions.
- Output: Multitude of achievement scores (only reports for achievement in basic subjects—see article summary).
- Significant: Per-pupil expenditure (lower grades).
- Insignificant: Per-pupil expenditure (upper grades); ADA.

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APPENDIX F

A PROGRAM IN THE AREA OF PRODUCTIVITY: STIMULATING GREATER USE OF TECHNOLOGY IN EDUCATION

The last quarter century has been characterized by radical advances in the communications media. One need only think of the impact on most individuals—particularly children—of mass television-viewing, or the industrial and technological changes wrought by the advent of high-speed computing devices. Marshall McLuhan has made a career of popularizing his views on the results of these developments; other somewhat more sober futurists (e.g., Peter Drucker and Alvin Tofler) have also commented on the current and foreseeable future changes in our society directly ascribable to the speeded-up communication process.

Interestingly, the new technologies have made very little difference in the one endeavor totally concerned with communication, namely the educational system of the country. True, new subfields (e.g., film production and computer sciences) have been introduced on some campuses, and prospective science professionals learn new techniques necessary to their careers. But the way in which the substance of education at all levels and in most fields is communicated remains essentially unchanged, despite investments running into hundreds of million dollars. Why the unwillingness or inability of educational systems and institutions to take advantage of the new communications technologies?

Systems and institutions of education are essentially conservative and static. Their heaviest investments are in staff, and then in buildings. Neither are easy to convert to new practices, nor can they be quickly eliminated and replaced by up-to-date elements. Initial investment to install effective new communications technology is often high. At a time of financial crisis for school systems and universities, funds must be used for maintenance of the operation rather than its improvement, even though such improvement would prove cost effective in the long run. While appropriate mechanical devices are available, intellectually respectable substance (i.e., software) is often missing, R&D having been largely concentrated on hardware. The failures of teaching machines and closed-circuit educational television are largely ascribable to this fact. Too little is known about the man-machine interface in the learning process. What part of

information purveying is most effectively done via a non-human mediator? For what age levels and what types of learning is the physical presence of a human being indispensable? What little evidence we have does not always bear out popular notions. In an experiment in Brooklyn's Brownsville section, both elementary school children and adolescents appeared to make better progress when taught to read via a mechanized responsive environment system, perhaps because the neutral machine was endlessly patient and voiced no adverse criticisms. At the Oakleaf School, small children learn to use the well-arranged storage and retrieval system of learning units without adult help. The independence and purposeful activity of six- and seven-year-olds in such a setting is in marked contrast to traditional primary classrooms. Development in the knowledge industry has been most active in areas where quick profit returns were to be anticipated. After some initial investments in developing educational applications, many profit-making concerns have withdrawn from this activity in favor of sure-fire educational products (such as textbooks) where markets and sales techniques are established and well understood.

The recent history of the application—or lack thereof—of communications technology to education makes it clear that no advancement is to be expected without well-planned Federal initiatives. And yet, increases in productivity in most fields share the two common elements of competition and mechanization, the latter generally attended by conversion from labor-intensive to capital-intensive operation. The program activity suggested above under the title "The Unbundling of Higher Education" is one attempt to introduce competition into the system; the activities sketched below are aimed at using technology to increase productivity.

1. Specific Objectives of this Program

- a. To establish a firm base for systematic experimentation in which educational technology is introduced with a specific focus on productivity;
- b. To conduct experiments that have a high potential for pay-off;

c. On the basis of such experiments, to support viable models of effective use of technology in education.

2. The Proposed Plan

a. Contract for studies examining the history of R&D in educational technology in order to identify the crucial factors leading to successful applications in specific instances, while inhibiting broader use. While a considerable literature exists in this field, no critical analysis is as yet available to allow the setting of priorities based on likely pay-offs for further investments in educational technology.

A variety of media could be included in the NIE studies: closed-circuit educational television; cable television, in and out of formal instructional settings; radio and audio cassettes; films, video tape, and audio tape cassettes; computer-assisted instruction; computer-managed instruction; communication satellites; and "old-fashioned" media such as printed texts, correspondence instruction with suitable counseling and tutoring, etc.

Each of these media could be examined along several dimensions: educational effectiveness, for both the cognitive and affective growth of students; costs, for start-up and for continuing operations; suitability for specific settings: age levels, subject matter, physical environment, human support components, etc.; political and social factors facilitating or impeding adoption; and anticipated contribution to productivity.

b. On the basis of such studies, the most promising opportunities could be identified. A second input component is likely to result from the current efforts of the Committee on Automation Opportunities in the Service Areas, particularly its Education Panel. Possible choices for next steps are already emerging from the extant literature, for instance:

1) A community college with a very small campus that invests its capital in equipment rather than physical plant. Teaching would be conducted mainly in the home or in small decentralized and infrequent groupings of students.

2) Computer-assisted instruction in basic skills in elementary school, with attendant rearrangement of student-teacher ratio and diversification of staffing, including use of community aides and other paraprofessionals.

We would need, however, to marshal and analyze the available evidence much more thoroughly before launching into such specific initiatives.

c. Once initiatives are identified and priorities set, there might be some limited studies or experiments testing the assumptions made and filling in information gaps. Several examples, some already underway, will illustrate what types of projects could constitute this phase:

1) A study of incremental costs in providing specific social services via cable TV, assuming, as a given, installation costs and subscription to currently available programs. Included would be specified educational programs, health care (e.g., diagnostic) services, fiscal transactions (e.g., credit, payment of bills, etc.). Such a study is now being proposed to NSF by the Mitre Corporation and will probably be funded.

2) A test of computer-aided instruction at the junior college level, with a view toward establishing base line information on costs; suitability to various settings; and educational outcomes of two entirely different systems, one with large central computing facilities and numerous terminals and an easy programming language designed for local curriculum development, the other with on-site mini-computers and a centrally developed curriculum. This kind of experimentation is long-range (five years) and costly (\$10-15 million). It is, however, as indispensable to the wide-scale introduction of educational technology as any pilot plant, model plane, or limited metroliner service to the upgrading of the industries involved.

3) Production of a common-core curriculum to be conveyed via advanced telecommunication networks serving extended districts. Core facilities already exist in the Coast Community College district, for instance, and in the television network set up by SUNY in cooperation with local ETV stations. NIE might fund the development of substantial amounts of curriculum material, so that as much as half of lower division instruction for participating institutions could be taught via the telecommunications networks.

d. A second-state effort in which the most promising of the developments studied and tested in c. (above) might be implemented in several sites (five to ten). A subactivity could be the support of projects to overcome shortcomings identified in the preceding phase, such as improvements in accessing mechanisms (terminals) or in curricula substance, better mixes of

human-machine components, more astute management of social and political environments, etc. It is likely that this phase would be even more costly than c. but attached to these costs would be a high degree of confidence that the investments made would indeed result in enhancing educational productivity.

e. Widespread introduction of proven technologies in appropriate settings. This phase would be beyond the concerns of NIE, except for advisory and seed money support to assure successful installation. Continued monitoring of adopted innovations will be necessary to assure the introduction of cost-effective changes as advances are made in communications technology.